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LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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Editorial Notes.

Gas Administrators and the Needs of the Industry.

It has been frequently remarked that men who have been trained in a profession, or in industry or commerce, and afterwards have studied the law and been called to the Bar, become recognized as specialists in the particular sphere from which they have transferred their energies—to the advantage of their clients and themselves. Their internal knowledge of the art, craft, or business gives them power against "learned friends" who are not similarly equipped by training or experience. Applying this observed fact to the administration of gas undertakings, it may be held that every director and every committee man (whatever his own profession or calling) should regard it as a duty to become acquainted with the various phases of the gas business—with the means to success, with its difficulties, with the competition it has to meet, and so forth, in order that he may bring the knowledge to bear upon his administrative functions. In saying this, we do not intend to imply that preferentially boards of gas directors or committees should be composed entirely of men who have been engaged professionally in the gas industry. We strongly favour admixture of qualification; but we do say that, though an administrator's professional, industrial, or commercial knowledge in other directions may be of the highest order, he should also obtain an insight into any external business in the direction of which he is engaged, so that it may assist to correct judgment.

These are not new ideas; they are old ones revived. They have been recalled by the address of Mr. R. M. Rowe to the South-Western Conference of the British Commercial Gas Association at Ilfracombe, as reported in the last issue of the "JOURNAL." Mr. Rowe is Chairman of the Ilfracombe Gas Company; but, unfortunately, an accident confined him to his house at the time of the meeting, and therefore the notes he had prepared for use on the occasion were read by his colleague, the Engineer and Managing-Director, Mr. J. Armstrong. The address scintillated with thoughts on various matters which are vital to the well-being of the industry. There is nothing of the sciolist about Mr. Rowe; he takes an intimate interest in, and gives deep study to, the work upon which he has to adjudicate; and, therefore, he sees things in a light that is favourable to the progress of the concern over which he so ably presides, and that of the industry generally. His knowledge gives him a firm belief in the future of the industry, and helps him to appreciate the needs to further its services. His creed includes not only cheap gas, but good gas, and the holding of the balance fairly between consumers, stockholders, and all who serve the Company. We want more gas administrators who will study their work in like manner, and thus obtain cognizance of the requirements of the industry. Among other things, remarks made by the Duke of York at the recent dinner of the Incorporated Sales Managers' Association have not escaped the notice of Mr. Rowe. They were to the effect that the best men are required for both functions of production and selling, with complete co-operation between them—the complete realization by each of the importance and the difficulties of the other. "Supply without demand is of no value; output which "cannot be sold profitably is not an asset but a liability; "make without marketing spells bankruptcy." On the same occasion, Mr. Goodenough said: "Without efficient "salesmanship, efficient production must fail to achieve "its full and fitting reward." Mr. Rowe left those two pregnant statements for close and complete application by those he was addressing, as well as by himself, in the discharge of those duties for which, as members of one of the most important of British industries, they are individually and collectively responsible.

Going further into the address, it is seen that Mr. Rowe is a profound believer in the co-operative side of the industry's work, such as is performed by the British Commercial Gas Association. That co-operative work descends to a depth and rises to a height in the operations of the industry to an extent that, it can be said without depreciating the value of individuality, could not possibly be achieved by any single concern or person. Individual and collective operations have their particular spheres of effectiveness. In such an organization, there are potentialities of unassessable value; and everything possible should be done to develop them. No one can believe that an Association of this kind has a fixed ambit of work; and when it has been proved to be good (as in the present case), and has scope for enlargement, every interest demands that it be enlarged. Indeed, it is a vital necessity that all rational operations should be undertaken to tighten the hold of the industry upon the community. It has been proved that the Association is blessed with such inherent vitality that it does not want to have its work unduly circumscribed, but it seeks to push forward into new territory so as to render its services still more effective for the industry. The active spirits at the head of the organization are not afraid of constructive criticism, because such criticism provides a peg on which to hang the claim to the provision of the wherewithal to bring about expansion. In any business enterprise there cannot be extension without the introduction of new capital; and there cannot be expansion of endeavour on the part of the Association unless it has the means. By Mr. Rowe's address such considerations as these are suggested to the administrators of the gas industry throughout Great Britain; and we are confident that the degree of appreciation of their import on the part of directors and committeemen will have relation to their knowledge of the internal affairs of the industry, and of its needs in enlarging its services, despite being pressed on every side by the keenness of rivals.

Touching the appeal which Mr. Rowe made for the additional support that is necessary to the development of the capacity of the "B.C.G.A." for effective work for the industry, it is our firm belief that the industry's central organizations are carried on at the expense of the

industry in as frugal a manner as it is possible to conceive. It has been decided that there shall be a new scale of composite subscription for that work. In these days we cannot do without any one of these organizations; and it would be suicidal to bring about their disestablishment. The value of the work of the National Gas Council in all matters of policy is incalculable. The research work of the Institution of Gas Engineers is profitable and essential, and must be developed. The "B.C.G.A." has operated in the interests of the industry where the latter could never have ventured other than by the authority given by national representation. It is proposed (as Mr. Goodenough told the Conference) that all this shall be continued on the modest though higher subscription standard of 6s. per million c.ft. of gas, which the General Finance Committee representing the three central bodies have decided shall be apportioned as to 1s. 7½d. to the National Gas Council, 7½d. to the Institution of Gas Engineers, and 3s. 9d. to the "B.C.G.A." Six shillings per million cubic feet! Calculated on the 500 B.Th.U. basis, it represents the infinitesimal sum of 0·0144d. per therm—an insignificant contribution to secure such material effects. It is also learned from Mr. Goodenough's statement that, in addition to the 6s., members of the "B.C.G.A."—particularly company members—are going to be asked to subscribe a further 1s. 6d. per million, the whole of which is to be expended on newspaper publicity in the districts from which the extra money comes. Several companies have already promised the full 7s. 6d. Even with the 1s. 6d. added to the 6s., it only means 0·018d. per therm, computed on the 500 B.Th.U. basis.

We are sure that every gas administrator who makes a study of the position (excellent though the gas business is to-day) will agree that, in view of the new circumstances to which it is to be exposed in competition, advance and protection dictate the highest organization to secure the fullest effects of active propaganda. The optimism that was expressed at the Conference and the declarations of members that the gas industry is only at the beginning of things are true; but, to bring beliefs to consummation, we must work with all the acumen and commercial system that can be commanded. Otherwise, with strong forces opposing, there will not be achievement. These are matters which commend themselves to all administrators who have an intimate knowledge of the gas industry, or who, though drawn from other professions and businesses, have studied its affairs and needs; they will also, we hope, be an incentive to those directors and committeemen who have not made a point of interesting themselves more than superficially in their administrative work to make investigation on their own account. The result we are confident will be that they will become strong advocates of the utmost being done by co-operative agency to further the interests of the industry. In short, what is wanted is that everyone engaged in the direction of gas undertakings shall show himself to be of the true type of progressive.

Coal Purchasing at Glasgow.

It is not proposed to discuss the merits of the opposing policies of purchasing coal by tender or by private bargaining. Price in relation to value must always dominate; and each gas undertaking must decide which policy it finds the better to pursue. There are, of course, good arguments for both courses. We have no doubt that in areas where the coal-selling schemes are in operation, or about to be introduced, those responsible for their promotion would prefer that, for large supplies, there should be tendering. And how close in some areas will be the tenders for like qualities! The Gas Committee of the Glasgow Corporation are of opinion that the General Manager (Mr. J. W. McLusky) should be authorized to purchase the coal required by the Department in the ensuing year; and the Committee should know whether or not there is wisdom in the proceeding. If they were not convinced there is in their circumstances, they would not have made the suggestion. As a matter of fact, it was stated by more than one member at the meeting of the Corporation at which the minute giving the authority was introduced for ratification that the Department had been able through the Manager, in consultation with the Convener, to negotiate the purchase of coal at a lower price than was asked by the tenderers. This being so, there is advantage to the undertaking and the gas consumers. A policy that has proved politic is not usually thrown overboard without good reason. There was opposition to the proposal not from personal motives, but purely on the question of principle. The member who led the contrary view contended that purchase by tender is the safest, best, and cheapest method. Perhaps it is in normal times; but when in Scotland, Yorkshire, Lancashire, and the Midlands, and South Wales, there have been created what are tantamount to large coal rings, two of which at any rate have resolved to make public utility undertakings—gas undertakings among them—the pack-horses for the increases of price, there is good ground for the buyers seeing what can be done to alleviate the burden. There is naturally strong resentment among public utility concerns over the selective process which has been adopted by the coalowners involved in the three schemes. In such circumstances, it does not follow that purchase by tender is the "safest, best, and cheapest method." It has to be proved by experience under the new conditions. The Glasgow Gas Committee have found that the best and cheapest process is by watchfulness, inquiry, and private negotiation. Another point made by the opponents was that it was not right to put into the hands of one individual the authority proposed by the Gas Committee. The test of its being right or wrong is whether there is advantage; and the Committee assert plainly that there has been benefit to the Corporation and to the citizens by their procedure. Moreover, in this matter the General Manager acts in consultation with the Convener, so that if any member doubted (and no one does) the integrity of the General Manager in his fiduciary position, there is ample safeguard. The hard fact of financial benefit, too, would scatter any such unworthy doubt. We are glad to see from the speeches and the voting that councillors of different shades of political opinion—Labour and Moderate—supported the Committee, and that the recommendation was endorsed by the substantial majority of 40 votes to 17. That is an expression of confidence in the General Manager upon which we heartily congratulate him.

Coal Sampling and Analysis—Partial Drying of Gas.

The Presidential Address which Mr. Arthur Marsden, F.I.C., of Bristol, delivered to the members of the Western Junior Gas Association at their last meeting, is a masterly exposition of several subjects which have marked interest for the gas industry at the present time. In the first place, he deals with the testing of coal for gas making—a matter which is only conducted with precision in the best regulated works, is done in a haphazard manner in others, and completely neglected, to economic detriment, in many more. He rightly pleads for the utmost use being made of such methods of testing as are applicable to everyday working conditions, in order to ensure, first, that the coal delivered is satisfactory for the purposes in view, and, secondly, that it is treated in conformity with its characteristics in the carbonizing process. Unless this is done, obviously there cannot be the efficiency which produces the maximum economy in the operation, and the maximum reward in the products. He urges the use of standardized methods of testing and analysis, and for the utmost care in the important work of sampling. There is no part of the testing of coal that can produce so much error as ill-conditioned taking of samples. Such initial crudeness produces results that can offer no guidance and, in fact, as Mr. Marsden says, are worse than useless. Consequently, he urges that the sampling should be supervised by a trained person, who realizes the possibilities involved. A great deal of fundamental work has been done on this subject by the Fuel Research Board, by the United States Bureau of Mines, and by private research; and now a Committee of the British Engineering Standards Association are sitting to devise methods, which, it is hoped, may eventually be-

come international for both sampling and analysis. But that relates to the future, and we have to wait patiently upon events. In view, however, of the present diversity of methods adopted by gas undertakings in coal sampling and testing, we would emphasize the point made in the address that, until agreed standard procedure is evolved, the method used in making tests should always be stated when quoting results. Otherwise, for informative or comparative purposes, results cannot be dependable.

The next section of the address deals with that much debated and favoured subject—the partial drying of gas before distribution. This process, in the opinion of Mr. Marsden, has come to stay; and he is confident that in the future it will be looked upon as an essential part of the production of town gas. It is freely acknowledged by all who have put gas drying to trial that the benefits derived are of a magnitude which makes the low cost of treatment comparatively insignificant. Bristol has the calcium chloride system in operation; and it is pointed out that it costs only about 0·15d. per 1000 c.ft. treated. In the majority of cases, the President favours the drying plant being situated at the outlet of the holders; and he gives his reasons. His remarks, however, do not apply to waterless holders, because in such cases it would be a distinct advantage to have the drying plant before storage, as emulsification and freezing of the sealing medium would be prevented, and a larger range of media would be available. Of course, the drying of gas need only be carried to a point sufficient to prevent deposition, as any further removal entails extra cost, and more than in proportion as the ratio of removal increases. With the plant at Bristol, a large amount of experimental work has been carried on, with the result that various beneficial changes have been effected. For example, in the original plant, there were four circulating pumps in addition to a fifth reciprocating pump for supplying calcium chloride solution continuously to the washer. It was discovered that the better method of working was to dissipate the heat of reaction by means of a comparatively large flow of calcium chloride through the washer rather than use a low flow and separate circulation through each section. The arrangement finally adopted is shown in one of the illustrations in the address; and it has these advantages: (1) The reduction in the number of pump units from five to one, with reduced wear and tear; (2) the calcium chloride from the evaporator is cooled before entering the washer; (3) there are fewer pipes and simpler pipelines. With this final arrangement, there is the important consideration of a greater temperature difference between the calcium chloride to cooler and the cooling water, with the result that the coolers are more efficient and yield a cooler liquor to the washer. It is found that the temperature of the solution entering the washer approaches to within 1·5° Fahr. of the cooling water temperature, so that, from knowledge of the vapour-pressure of calcium chloride solutions, it is possible to predict the theoretical dew-point of the outlet of gas to within (say) ± 2° Fahr. from the temperature of the cooling water. Experience shows that the actual dew-points correspond closely with this. A further instructive feature of the address is the dissertation on methods of determining dew-points.

Beyond this indication of the contents of this section of the address, we will not go—sufficient having been said to show that all gas engineers and chemists who are interested in the subject will find value in investigating the summary given by Mr. Marsden of the useful work that has been done in this connection at the Bristol Gas-Works. We would only point out further, as bearing upon the practical effects of the process, that there are several districts supplied with gas almost exclusively from the Stapleton Works (where the plant is situated); and the results of syphon pumping (with 954 syphons) gave, in February, 1927, 1436 gallons, and, in February, 1928, 280 gallons. Thus the amount of condensate has been reduced by approximately 80 p.ct. Actually, Mr. Marsden points out, the improvement is much greater, because the 280 gallons was obtained from very few syphons, and was largely due to inward leakage. In fact, these results have led to the detection and correction of numerous faults in the mains, mostly of slight nature; and generally the lime content of the water has been sufficient guide as to its origin.

Educational Facilities.

The final part of Mr. Marsden's address directs attention to the remarkable facilities for training which students of Gas Engineering and Gas Supply have in these times compared with the training days of their predecessors. We have heard so many complaints regarding the deficiencies of the Institution Education Scheme that it is refreshing to have from the Presidential Chair of a Junior Association the marks of approval that we find here as to what has been done in the attempt to meet a variety of external circumstances which it is difficult to compose without affecting the scheme fundamentally. Through the scheme there are laurels to be gained by the students; and ingenuity has been at work to provide for their realization. But there is one thing the Institution cannot do, and that is to alter the circumstances that exist through the length and breadth of the land, so as to make them fit-in precisely with the objects of the scheme. The alternative is to make the scheme fit them so far as it is prudent to go without degrading its principles and intentions.

At the outset of this section of the address, Mr. Marsden points to the petition of the Institution for a Royal Charter; and he accentuates the fact that, while this distinction will add considerably to the status of the body as a whole, it will greatly increase the value of membership as indicating the possession of certain definite qualifications. This being so, the ultimate membership of the Institution should be one of the goals sought by all juniors. From this, and from what are known to be the qualifications for membership of the corporate Institution in future, it will be seen that there must be a jealous safeguarding of the Education Scheme as one road to admission to the Institution, so that entrance is only achieved on the basis of initial equality. Indeed, the scheme and the future of the Institution are now closely bound up together. However, upon the question of qualification, a pointed remark was made by Mr. Marsden which perhaps will receive attention when any further modifications of the scheme are under consideration. He said: "My own view is that probably at some time in the "future the Institution will, in common with other bodies "such as the Institution of Civil Engineers, not inquire "into the means by which candidates obtained their know-"ledge of ancillary subjects, so long as they can show "proof of that knowledge, together with its practical "application." He is also impressed by the great value of the Education Sub-Committees which have been set up in various districts, and which are channels through which advice may be obtained by any student who finds himself marooned in respect of the necessary educational facilities. These Sub-Committees can do much to make smoother the way of those who find themselves in difficulties in this respect; and good results should accrue from such work, especially in such a large and scattered area as obtains in the South-West of England. Although probably this is one of the worst areas of any in respect of technical education facilities, we have heard less complaint from it than from some others that are comparatively wealthy in that respect.

Rather a widespread mistake is corrected in the address. It is that the Sub-Committees were only designed to deal with the major courses of the Education Scheme. That is not so. In the West of England a great deal of attention is being concentrated by the Sub-Committee on the minor courses; it being realized that the men to whom these apply are of great potential value to the industry, and yet it is very difficult to deal with their case. But there are hopes that a number of centres for them will be inaugurated in the area where recognized courses in gas-fitting will be provided. That is good. We congratulate those concerned upon their enterprise and endeavour, and wish them large success. Some informative particulars are also given by Mr. Marsden regarding the operation of the Education Scheme at the Merchant Venturers' School at Bristol. Those who are interested will consult the address. Incidentally, it is mentioned that the Gloucestershire Education Committee (where application is made and approved by them) pay the travelling expenses of students at the College who are resident in the administrative County of Gloucester. It is clear from this that the authorities are boldly endeavouring to make

their county rank, notwithstanding its geographical disabilities, from the technical education point of view, equal with others in assuring that its young men are not left behind in the race through inability to obtain a sound fundamental technical training. If those who should be students in that area are not attracted by all the inducements held out to them, then we utterly fail to see what plan could prove effective. In other days such facilities were not provided for obtaining qualification by young men desirous of securing higher places in the work of the world. In view of the effort that is being expended to assist them, students must do something to help themselves, and more especially in their own interests. If they do not think it worth while to avail themselves of the facilities, then, with the growth of the new order of things which we see going on, they may fairly anticipate that the higher places will not be for them.

Educational Course for Teachers.

In our "Correspondence" columns, Mr. F. W. Goodenough draws attention to the course for teachers of Gas Engineering and Gas Supply which the Board of Education have arranged at the Westminster Training College and the Westminster Technical Institute from July 23 to 27. Last year the course was highly popular; but so far this year, it is understood, the number of applications is smaller than was anticipated. This is a great pity, as the course offers an opportunity of which teachers or intending teachers should avail themselves. In view of this, although the period within which application should have been made has expired, favourable consideration will be given to further applications, which should be made on forms obtainable from the Secretary, the Board of Education, Whitehall, S.W. 1. As Mr. Goodenough says, if the industry's Education Scheme is to be fully successful, the right teachers must be available. It has to be remembered that to possess knowledge is one thing; to know how to impart it another. We hope that the letter will have good effect in supplementing the applications.

Coal Marketing Schemes.

There seems to be some uncertainty as to the position of the South Wales Marketing Scheme. Things are not running so smoothly as the prime movers would like. Some colliery firms have made reservations which are a stumbling-block, and must be removed before the scheme can be put into full operation. Then there are large exporters and colliery owners who have declined to join in the scheme, and therefore other firms find it necessary to insist that, where they come in rivalry with the dissentients, they should have a free hand, and not be bound by the decisions of the Executive Committee of the Coal Marketing Association. Such a fast-and-loose system is regarded as unworkable; and therefore the Executive Committee have appointed a Sub-Committee to go thoroughly into the question of the reservations, and endeavour to reconcile the various conflicting interests within the scope of the scheme. That will be difficult. While this is the position in South Wales, the President of the Miners' Federation (Mr. Herbert Smith) is raising his voice over the thousands of miners who are losing employment in the Yorkshire area through the closing of pits; and he seems inclined to attribute this to the operation of the Five Counties Scheme.

Need for Technical Publicity Men.

At too many meetings of scientists and engineers are extraordinary statements concerning the gas industry made which ought not to be broadcast without criticism, but which are allowed to pass unchallenged because there appear to be no technical gas men at these meetings. The industry should take a far keener interest than it manifests at present in meetings of external technical bodies, when problems relating, either directly or indirectly, to the industry are being discussed; and at all these meetings it should be represented by men fully qualified technically to correct misapprehensions concerning its work and outlook. The aim should be, not to indulge in idle controversy, but to present facts. As an example of the seeming apathy in this direction, at a meeting of the Institution of Engineering Inspection on April 13, observations regarding the industry, though wrong, were subject to no criticism. The authors of a paper on "Low-Temperature Carbonization"—Messrs. R. P. Wilson and C. H. Parker—explained that gas manufacture as at present practised consists of making a gas of 350 B.Th.U., and then enriching by a highly expensive and complicated oil carburetting process. As for the coke, it was alleged that it is not suitable for domestic use; and the impression was given that no attempt is being made to produce a gas coke which satisfies domestic requirements. Here was an opportunity—only one instance of many others which are lost—of emphasizing that low-temperature carbonization is not the only means, or even the best method, of producing a smokeless fuel for domestic purposes both in open firegrates and in hot water boilers. Only recently we inspected some excellent high-temperature semi-coke made in gas-works. The fuel was in a condition suitable for transport, could be ignited with commendable ease by the ordinary method of paper and wood chips, and, burning in an ordinary grate, gave a fire the radiant efficiency of which was far superior to coal. To-day there is need not only for general publicity—Press advertising, window displays, maintenance service, and so on—but for technical publicity of the type to which attention is drawn here.

Rates and Industry.

As this issue of the "Journal" is going to press, the Chancellor of the Exchequer is unfolding to the House of Commons the proposals of the Government with reference to the partial relief of industry and agriculture from the burden of local rates, which is very heavy. During 1926-27, there was collected in rates by the local authorities of Great Britain a sum, in round figures, of £180,000,000. The purpose the Government have in view is to provide a certain amount of assistance from the National Exchequer. There have been optimistic suggestions that the degree of assistance will represent probably £28,000,000 to £30,000,000. But there is more likelihood, according to the prophets, that the amount will be in the region of one-third of the higher sum. We see that the Chairman of the Finance Committee of the Manchester Corporation, Alderman H. J. Goldschmidt, has criticized the Government intentions. In his view, for them to take over certain burdens, or to increase the grants-in-aid now given, is merely to shift the incidence from one class of ratepayer to another, which, in his view, only aggravates the present inequalities. The effect of many Government grants has been to increase expenditure; and Alderman Goldschmidt therefore makes the point that, in any assistance the Government render, they ought to be assured that it is not used to enable local authorities to spend more.

Coal Output.

During last month, the weekly production of coal varied very little from the 5 million mark. During the week ended March 3, the quantity raised was 4,977,200 tons, with 956,600 workers; March 10, 4,884,600 tons, with 954,600 workers; March 17, 4,989,100 tons, with 951,300 workers; March 24, 5,072,600 tons, with 949,800 workers; March 31, 5,270,400 tons, with 950,500 workers. It is interesting to note that the coal shipments from the Tyne in the first quarter of this year amounted to 3,895,946 tons, which was 291,439 tons less than in the corresponding period of last year.

The Miners' Industrial Union.

The General Council of the Trade Union Congress have had three rebuffs over their desire to take a ballot of the Nottinghamshire miners, to see whether they wish to be represented by the Miners' Industrial Union (non-political) or the Notts Miners' Association, which is a member of the Miners' Federation. The Industrial Union refused to take part in a ballot; the coal owners declined to provide special facilities for the ballot; and then a Committee of public men who had been asked to see fair play decided that the conflict of interests was so sharp that no action on their part could serve any useful purpose. But the General Council are determined there shall be a ballot; and there are indications that it will take place during next week. If members of the Industrial Union decline to vote, the result can only be a fiasco; and the Industrial Union and the coal owners will not accept the decision. It is therefore likely the General Council will have the mortification of finding their efforts on behalf of a branch of the Miners' Federation have been in vain.

PERSONAL.

The President of the Institution of Gas Engineers is, we regret to learn, suffering from a septic throat, and is by doctor's orders confined to bed. We are, however, assured by Mr. Madden personally that the infection is yielding to treatment, and that he is expected to be about again in a fortnight's time.

The staff and employees of the Slough Gas and Coke Company have recently presented Mr. A. THOMAS, who has retired from the position of Secretary to the Company, with a well-fitted easy chair. The presentation was made by the Engineer and Manager (Mr. H. Wilkinson), who remarked that Mr. Thomas's long association with the Company (56 years) had earned for him the respect and regard of all.

Mr. JOHN MCCUBBIN, retired Resident Engineer of the Hong Kong and China Gas Company, Ltd., left £8979 (net personalty £7790).

Mr. FREDERICK JAMES NORTH, who was a Director of the Nuneaton Gas Company, left gross estate valued at £18,133, with net personalty £16,934.

Upon the occasion of his forthcoming marriage, Mr. THORNTON WILLEY was, on April 17, at the Exeter offices of Messrs. Willey & Co., Ltd., meter makers and engineers, presented by the Exeter and London staffs of the firm with a handsome candelabra of Georgian Sheffield plate. The presentation was made by the Secretary to the Company (Mr. George Lane), who voiced the good wishes of the subscribers.

The wedding took place at Blackpool Parish Church, last week, of Mr. H. A. DICKINSON and Miss D. M. Holt. The bridegroom is a technical assistant on the staff of the Corporation gas-works, and his colleagues gave him a brass coal-box, embossed in relief.

OBITUARY.

We regret to have to record the death of Mr. WILFRED IRWIN, Managing Director of the West Cumberland Bye-Products Company, Ltd., of Flimby, which took place suddenly in Jerusalem on April 11, while he was on a visit to Palestine. He was interred in the Friends burial ground at Ramalleh, a few miles outside the city. Mr. Irwin was well known in chemical and gas engineering circles, especially round Manchester. After leaving Owens College, he was for some time Chief Chemist to Messrs. Hardmans. While working with them, he invented and started the first plant for the recovery of benzole from coal gas, and also the method of separating carbolic and cresylic acids from coal tar by the CO_2 method. After leaving Messrs. Hardmans, he practised as a Consulting Chemist, and in 1910 organized and put into operation the works of the West Cumberland Bye-Products Company, Ltd., in Cumberland, in connection with the coke industry of that county. He was much interested in the problems of rainfall and the distribution of salt in the rivers and rainfall, and had studied the rivers and lakes of Cumberland, and also the Jordan and the Dead Sea in this light, and had read several papers on this subject. He was one of the original members of the Manchester Section of the Society of Chemical Industry.

ELECTRICITY SUPPLY MEMORANDA.

THERE are electricians who do not like the testimony that Mr. Edward Dixon gave in a recent issue of the "Electrical Review" to the economy and efficiency of the coke-boiler for water heating. His experience is that with this handy servant he is able to get all the hot water he requires for household purposes, baths, hand basins, kitchen, and two radiators (when required) for 3s. per week. We commented upon this certificate to excellent conduct in the "Memoranda" for April 11. Mr. R. J. Hebbert is one of the correspondents who does not approve of Mr. Dixon's bold championship; so he tries to belittle it by saying that that gentleman falls into "a common error of including only the bare cost of fuel, and thus setting at naught the labour involved in firing, maintenance, and extra household cleaning." That is a vague sort of contra to set against the large-hearted service that the coke-boiler renders in respect of hot water supply, as well as being a splendid incinerator for house refuse. The argument as to labour saving can be carried to the point of silliness, when against it can be set an abundant service, convenience, and economy. But Mr. Hebbert says: Forty gallons of water at 105° Fahr. is equivalent to approximately 05 gallons at 110° Fahr. (the average temperature required for household purposes), and this can be obtained with a consumption of about 17½ units, costing at ½d. per unit only 8¾d. That is interesting. To raise 40 gallons of water from 49° to 195° Fahr. means a total increase of temperature of 58,400°; and as 17½ units of electricity is equivalent to 59,710 B.Th.U., Mr. Hebbert claims an efficiency of 97·8 p.ct.—only allowing 2·2 p.ct. for all losses due to storage and transmission. Far be it from us to say anything rude. We will leave our readers to draw their own conclusions from the obvious facts. For 8¾d. 100,000 B.Th.U. can be obtained by gas; and if anyone mentioned the quantity of hot water that can be obtained with 8¾d. worth of coke, these electrical advocates would shake with anger. So we had better not tell them anything about it. We are quite content with the progress coke and gas are making for water heating compared with electricity, the crude slow behaviour of which, together with its unreliability, has caused many unpleasant things to be said in some dwelling places the occupants of which have been cajoled into paying heavily for installation for the wretched service rendered—"wretched," we ought to explain, compared with the relative cheapness, quickness, and economy of coke and gas.

Electricity v. Coke.

Our friend the "Electrical Review" adds its editorial voice to the discussion. It does not—dare not—controvert the statement that the central heating of water is cheaper with coke than with electricity. Electricity undertakings are using coke as a fuel, and getting 80 p.ct. and more efficiency in their boilers; but in electricity only 20 p.ct. (to give our friends their best) efficiency in electrical energy, which electrical energy it is proposed to use, in part, for water heating. However, our contemporary admits, and in italics for emphasis, that coke is "*the cheapest in respect of the cost of energy.*" Asking whether this is the "sole" consideration, the "Review" proceeds to inquire whether Mr. Dixon buys the cheapest boots he can find in the market. "Does he hold that English beef is 'out of the discussion' because chilled meat can be bought at a lower price? And does he travel on foot to save money? If so, we agree that he is consistent in selecting the cheapest method of heating." Although we have puzzled our brains, we fail to see the analogy or the strength of the argument. It is heat that is wanted from a heating agent; it is wear that is required from boots; and it is nutriment that is needed from meat. If more heat can be obtained from one agent than from another and at a lower cost, that is the agent that will be most popular; if more wear can be obtained from a pair of boots costing a few shillings more than a pair of less substance or quality, then the additional cost (if one can afford it) will be willingly paid; if we are certain we are buying English meat and that it contains more nourishment than the frozen variety, if one can afford it, it will be bought. Our contemporary must forgive us, if we say its argument is painfully feeble and terribly wide of comparative value.

An Editorial Argument.

The "Review" falls back on "comfort, cleanliness, convenience, and other factors which enter into the true account of cost." There is a great deal of "comfort" and "convenience" in the range of service rendered by the coke-boiler—much greater in time, volume, or any other consideration which can be applied to electrical operation—and it is obtained at lower cost. As to cleanliness, coke is not smoke-producing, and the clearing out of the ashes is not an arduous task considering the weight of compensation. These are matters which must be looked at from the practical point of view; household efficiency is an important factor, and to gain it a little expenditure of labour is in this case highly profitable. We are wondering what are the "other factors" which are vaguely alluded to, but which we cannot discuss because they are not defined. The "Review" goes on to submit that people cannot expect to get the "best" article for the lowest price—meaning thereby electricity. But what constitutes the "best" article? Surely not that which gives the least effect in respect of the purpose to which it is applied, and yet at the highest cost? The "best" article must be that which gives the highest service for the lowest expenditure. Our contemporary claims, "without fear of contradiction," that for cooking and heating electricity is the "very best" agent; and that it is worth paying for at double the rate of any rival. Well, we do contradict it; and thank goodness all people are not fools. If they were, the gas industry would perhaps not be making the progress in business that it is doing to-day. Here is further evidence of littleness, of thinness of argument, and of unadulterated nonsense: "Who can appraise the value of getting the smell of gas out of the house? Even that is worth a good deal." Really our contemporary by its argument exposes the feebleness of the case for electricity in water and other heating. If electricians cannot do better than that, they should refrain from print.

Combined Lighting and Water-Heating Service.

Electrical men are adepts at the construction of tariffs and systems which confuse consumers, and make them wonder how they can supply electricity at such vastly varying prices. The *raison d'être* for many of the methods is to secure a better load for the generating station; but there is great doubt, having regard to the average price received, whether the advantage to the station is not seriously off-set by financial disadvantage. Some of these new methods necessitate the complication of the consumer's equipment, and give fresh seats for trial and difficulty. Mr. A. W. Blake, of Willesden, has introduced a complication for combining electric lighting and water heating, which is described as providing "an economic service to the consumer, while safeguarding the supply undertaking against any substantial increase in the peak load." The latter was probably kept in view more than the economic service, which is truly on the economical side, seeing that it gives the consumers daily a 10-gallon storage of hot water, which will be about sufficient to bath baby, if a family possesses one—otherwise it could be used by one adult for a sponge down. To avoid any charge of misrepresentation, we will extract some particulars from "Hotspot" in the "Electrical Times."

How it Works.

As said, the scheme provides for the combination of lighting and heating, and a 10-gallon hot water storage tank (loaded to 240 watts) is utilized. The elements are divided into three sections of 80 watts each. The water-heating circuits are interlinked through a special simplified form of relay. The relays arrange for the switching-out of one section of the water-heater load (80 watts) for every 80 watts, or part thereof, of lighting load switched-on. For example, on switching on (say) a 40-watt lamp, one 80-watt element in the water-heater will be cut out; other lamps up to a total of 80 watts can then be brought into service without affecting the water-heater. When the combined lighting load exceeds 80 watts, a second section is automatically cut-out, and so on. As the lighting load is switched off, the reverse action takes place; and the elements of the water-heater are again brought into circuit. And so the erratic work of water heating goes on. The maximum load under these conditions cannot exceed 240 watts. The load factor of the combined supplies, it is said, will be not far short of 100 p.ct.

All for 0·65d. per Unit.

Regarding the cost to the consumer of this fantastic proposal, "Hotspot" tells us that the rate at which the combined supply is offered is (up to 240 watts) the fixed charge of 39s. per quarter (or 3s. per week), inclusive of the hire of apparatus. The actual capital cost of the whole supply given last year by the Willesden undertaking (inclusive of bulk supply charges) worked out at £5 10s. per kw. per annum. On this figure, the charge to the consumer (for a load of 240 watts) is £1 7s. 6d. per annum, or approximately 7s. per quarter. The water-heater hire is 6s. per quarter—this makes a total for overhead costs of 13s. per quarter. A balance of 26s. is thus available for meeting the generation costs of the energy consumed, profit, &c. At 100 p.ct. load factor, 240 watts will account for 524 units per 91 day quarter. The average price per unit thus works out at 312 ÷ 524 = 0·6d. per unit. Actually a 100 p.ct. load factor will not be secured, and Mr. Blake, on experience already obtained, estimates an average consumption of 480 units per quarter. This corresponds to an average price of 0·65d. per unit, which, "Hotspot" avers, will be quite profitable under the special condition, even though the consumer does get his lighting supply at this figure. In the "Electrical Times" Tables of Costs, the Willesden total working costs per unit sold in 1927 are given as 1·58d. We wonder how the 0·65d. per unit for lighting complies with section 20 of the 1882 Act: "The undertakers shall not, in making any agreements for the supply of electricity, show any undue preference to any local authority, company, or person."

Mishaps.

Damage estimated at about £4000 was caused by a fire last Saturday week at "Riverside," Llansaintffraid (Mon.). The house was gutted, and most of the contents were destroyed. The place was not occupied. The only suggestion as to the origin of the outbreak is the fusing of electric wires, causing a fire which smouldered for several hours before breaking into flame. It was 6 o'clock in the morning when the house was noticed to be ablaze. On Thursday evening, there was a failure of electric current in the Marylebone district. In its effects it was serious, as two telephone exchanges, two important postal sorting offices, hotels, restaurants, and shops on the north side of Oxford Street from Marble Arch to Oxford Circus were plunged in darkness. There was delay in sorting the mails at the Western District Sorting Office in Wimpole Street, and at the Parcels Sorting Office in Bird Street, and the mail vans were held up. Recourse was had to the friends of electricity—candles and oil lamps—for illumination. Detectives and policemen were specially active in looking after the interests of jewellers' shops and sorting offices until the light was restored. Lynford Hall, Norfolk, was destroyed by fire last Saturday. The outbreak was noticed in the roof of the east wing; and the flames spread rapidly to the whole building. "It is believed that the fire was caused by the fusing of an electric wire."

FORTHCOMING ENGAGEMENTS.

April 28.—Midland Junior Gas Association.—Visit to the Apedale Pits of the Midland Coal, Coke, and Iron Company, Ltd.

May 3.—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—General meeting at Tredegar (Mon.).

May 4.—North of England Gas Managers' Association.—Annual general meeting in Newcastle, 2.15. Papers by Mr. L. H. Sensicle ("Recovery Methods and the Ammonia Problem") and Mr. W. L. Robertshaw ("Notes on the Design, Maintenance, and Working of Coal and Coke Handling Plants").

May 4.—London and Southern District Junior Gas Association.—Annual general meeting.

May 8.—National Gas Council.—Meeting of the Central Executive Committee.

May 8.—Federation of Gas Employers.—Meeting of the Central Committee.

May 9.—British Commercial Gas Association.—Conference of the Midlands District at Redditch.

May 9.—Manchester and District Junior Gas Association.—Visit to Messrs. Jacob's biscuit factory, Aintree.

May 10.—Midland Junior Gas Association.—Annual general meeting.

May 11-15.—Society of Chemical Industry.—Conference in London, organized by the Society in co-operation with its London Section and Chemical Engineering Group and the Institution of Chemical Engineers.

May 16.—Southern Association of Gas Engineers and Managers (Eastern District).—Meeting at No. 28, Grosvenor Gardens, S.W. 1, at 2.30.

May 16-17.—Eastern Counties Gas Managers' Association.—Meeting at Bedford.

May 17.—Society of British Gas Industries.—Annual general meeting at the Hotel Cecil, W.C. 1, under the presidency of His Grace the Duke of Sutherland.

May 18.—Southern Association of Gas Engineers and Managers.—Visit to the works of the Rochester, Chatham, and Gillingham Gas Company.

May 19.—Scottish Junior Gas Association (Eastern District).—Annual general meeting in Edinburgh. Presidential Address of Mr. E. L. Farquhar.

May 19.—Yorkshire Junior Gas Association.—Meeting at Elland. Paper on "Coke" by Mr. R. Crowther.

May 22.—Central Committee of the Federation of Gas Employers.—Meeting at the Hotel Cecil, 10.30.

May 22.—Central Executive Board of the National Gas Council.—Meeting at Hotel Cecil, 11 o'clock.

May 22.—Federation of Gas Employers.—Annual general meeting at the Hotel Cecil, 2.15.

May 22.—National Gas Council.—Annual general meeting at the Hotel Cecil, 3 o'clock.

May 24.—British Commercial Gas Association.—Conference of the Cornish District at Truro.

May 24.—Midland Association of Gas Engineers and Managers.—Spring general meeting at Willenhall.

The Institution of Gas Engineers.

All meetings take place in the Council Room at 28, Grosvenor Gardens, unless otherwise stated.

April 28.—Examination in Gas Engineering and Gas Supply held at centres in England, Wales, and Scotland.

May 1.—Refractory Materials Joint Committee.

May 7.—Sub-Committee of Gas Investigation Committee, at the University, Leeds.

May 8.—Executive Committee of Gas Education Committee.

May 21.—Emergency Committee.

May 21.—Finance Committee.

May 21.—Luncheon to the President, by invitation of the Council.

May 22.—Gas Investigation Committee in morning; Effluents Committee and Sulphate of Ammonia Committee in afternoon.

June 12.—Council meeting in the Cory Hall, Cardiff.

June 12-15.—Annual General Meeting at Cardiff.

June 14.—Council meeting in the Cory Hall, Cardiff, for the appointment of Committees for the year 1928-29.

July 10.—Gas Education Committee.

THE INSTITUTION OF GAS ENGINEERS.

Council Meeting.

A Meeting of the Council of the Institution was held at the Institution of Electrical Engineers on Monday, April 2—the President, Mr. H. D. Madden, M.Inst.C.E., M.I.Mech.E., in the chair. There were also present: Messrs. W. E. Price, Hon. Secretary (West Chobham), J. Terrace, Vice-President (Lower Sydenham), C. Rhodes Armitage (London), W. H. Bennett (Redhill), F. C. Briggs (Dudley), J. H. Canning (Newport, Mon.), T. Carmichael (Portsmouth), W. E. Caton (Oxford), H. E. Copp (Hull), R. E. Gibson (Liverpool), H. H. Gracie (Edinburgh), P. G. G. Moon (Bournemouth), R. Robertson (Bristol), C. S. Shapley (Leeds), H. C. Smith (Tottenham), G. E. Shrimpton, of Radcliffes and Hood St. Barbe Sladen and Wing (the Solicitor), and W. T. Dunn (Secretary).

The final draft of the Petition, Charter, and By-Laws in connection with the application for a Royal Charter was considered and approved for submitting to the members at a meeting taking place the same day.

The names published in last week's "JOURNAL," p. 167, were approved for insertion in the next ballot list to be issued.

A communication was reported from Mr. S. Meunier on the subject of sales of coke, and it was resolved that a letter should be addressed to each of the affiliated District Associations calling their attention to the matter, and asking for their views upon it, in order that some concerted action might be taken if considered desirable.

At the conclusion of the meeting, Sir Henry Maybury, K.C.M.G., and Mr. Henry Woodall (elected a Member of the Institution in the year 1865) were introduced to the Council, and were warmly greeted by them.

CHEMICAL INDUSTRY CONFERENCE.

London, May, 1928.

The Rt. Hon. the Earl of Balfour, K.G., O.M., in the course of his Messel Memorial Lecture in July, 1926, expressed his apprehension as regards the power of British chemists to apply scientific knowledge to industry. This was regarded as being a friendly challenge to the chemical industry, and coming from so learned a thinker and observer, could not be ignored.

In May there is to be a practical reply to the Earl of Balfour's challenge in the form of a Chemical Industry Conference, to be held in London, organized by the Society of Chemical Industry in co-operation with its London Section and Chemical Engineering Group, and the Institution of Chemical Engineers. The subjects which are to be discussed demonstrate that chemical industry is at the heart of our national prosperity.

The Earl of Balfour indicated how large a number of great commercial interests depend upon nothing more than the proper use of coal, water, and air. The conference will show that the British chemical industry is leading the way in the economic utilization of these basic constituents. The first conference will be devoted to the subject of fuel, under the Chairmanship of Sir Hugo Hirst, Bart. Sir Arthur Duckham, K.C.B., will show the part that the chemical engineers can play in industry in the economic use of the national coal resources, and Prof. G. T. Morgan will give the conference the advantage of his work on low-temperature tars—a subject with which the whole commercial future of low-temperature carbonization is inevitably bound up.

There will also be a conference on the important subject of pure water supply, under the Chairmanship of Lord Desborough, G.C.V.O., when Sir Alexander Houston, K.B.E., will give a paper on "Water Purification," and Mr. J. H. Coste one on the "Pollution of Tidal and Non-Tidal Streams."

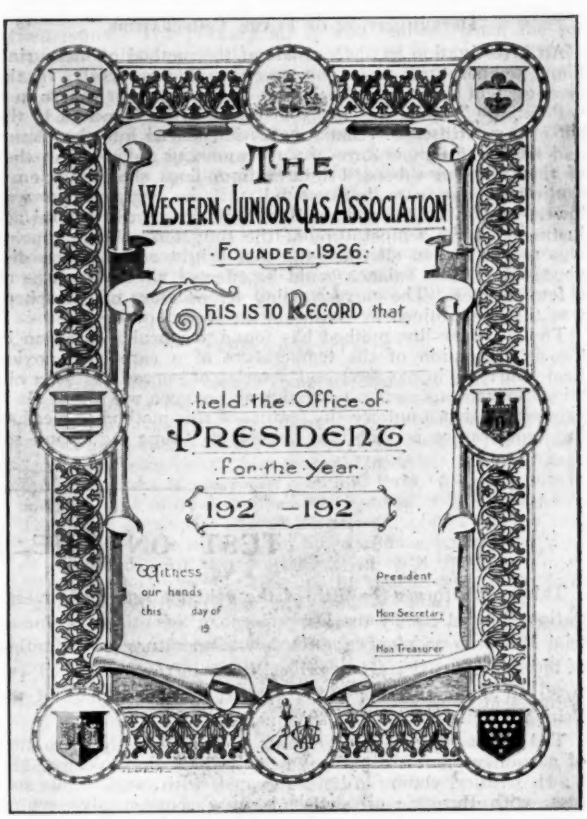
One of the greatest romances in chemical industry has been the development, during the past ten years, of the production of fertilizers by the fixation of nitrogen from the air. Not only have the technical difficulties of this problem been successfully overcome, but with the co-operation between the chemical industry and the Ministry of Agriculture, work of importance has been done in studying the most suitable methods of application of these new fertilizers in the promotion of successful crops and other agricultural products. It is therefore particularly opportune that two days of the conference should be given to the consideration of both the industrial side of these developments in the heavy chemical industry and the agricultural side of the application of these fertilizers. There is to be a conference when Sir Alfred Mond will give his views as to scientific research applied to industry. Lieut.-Col. G. P. Pollitt will give an account of developments in the heavy chemical industry, and Sir John Russell will deal with the part played by British scientists in the application of fixed nitrogen to the soil.

The conference is to last from Friday, May 11, to Tuesday, May 15. It is an attractive programme, and will undoubtedly be attended by large numbers of the members of the Society of Chemical Industry, the Institution of Chemical Engineers, and other kindred Societies. All communications relating to tickets and the detailed programme should be addressed to the General Secretary, Society of Chemical Industry, Central House, Finsbury Square, E.C. 2.

WESTERN JUNIOR GAS ASSOCIATION.

A Presidential Certificate.

The members of the Western Junior Gas Association have taken the lead among the junior organizations in presenting their retiring President with a certificate. The Association is the youngest among the junior ones. It has shown great virility; and the technical matter which has emanated from it has been of a character which has claimed widespread attention. The organization only came into being on Oct. 9, 1926. In the following July, the present President (Mr. Arthur Marsden, F.I.C., M.Inst.Chem.E., of Bristol) made the suggestion that the retiring Presidents should have a certificate; and the idea was cordially agreed to. Accordingly Mr. Marsden prepared a design, which was executed by Mr. W. Bennett, of Broad Street, Bristol. As will be seen by our photographic reproduction (unfortunately we cannot show the colours), the design is highly artistic. The border circles



contain "arms" representative of the counties in the Association's area. These counties are: Bristol, Gloucester, Somerset, Wiltshire, Dorset, Devon, and Cornwall. On the certificate we have:

Top left	County of Gloucester
Top centre	City and County of Bristol
Top right	Borough of Taunton, representing Somerset
Centre left	City of Salisbury, representing Wiltshire
Centre right	Dorchester, representing Dorsetshire
Bottom left	County of Devonshire
Bottom centre	"Spirit of Coal" and monogram
Bottom right	County of Cornwall

The arms of Bristol (City and County) were granted on Aug. 20, 1569. Taunton, the county town of Somerset, was incorporated in 1627; the emblem of the cherub being most probably derived from the former Abbey of Taunton. We congratulate the Association upon their certificate, which we are sure will be prized by retiring Presidents as a memento of their year of office.

North of England Gas Managers' Association.—Mr. T. P. Ridley (President) will occupy the chair at the annual general meeting of the Association, which is to be held on Friday, May 4, in the County Hotel, Newcastle-on-Tyne. Two papers are promised—"Recovery Methods and the Ammonia Problem," by Mr. L. H. Sensicle, B.Sc., F.I.C., of Newcastle; and "Notes on the Design, Maintenance, and Working of Coal and Coke Handling Plants," by Mr. W. L. Robertshaw, of Sunderland.

RESEARCH WORK AT TEDDINGTON.

The report for the year 1927 of the National Physical Laboratory, Teddington (which has just been published by H.M. Stationery Office, Adastral House, Kingsway, W.C., and Branches, for the Department of Scientific and Industrial Research, at the price of 7s. 6d. net), indicates that much investigation work was carried out during that period.

HEATS OF COMBUSTION OF GASES.

In the Physics Department, a research has recently been commenced on the heat of combustion of carbon monoxide. The gas is burned under atmospheric pressure in a vacuum walled vessel fitted with flow tubes for the continuous circulation of water. The temperature rise of the water is measured by a pair of differential resistance thermometers. The calorimeter has been designed so as to reduce the heat losses to a minimum. It is calibrated by substituting for the flame a resistance coil in which a measured amount of electrical energy is dissipated as heat. The preliminary work has been carried out using gas of 97 p.ct. purity; but when the various sources of error in the method have been eliminated, it is proposed to obtain gas of much higher purity.

DETERMINATION OF FLAME TEMPERATURE.

An investigation has been made of the method of measuring flame temperatures based on spectrum-line reversal. In the arrangement employed, the image of the tungsten sphere in a "Pointolite" lamp was focussed through the flame on to the slit of a spectroscope. Sodium was introduced into the flame; and when the temperature of the flame was greater than that of the tungsten sphere, bright sodium lines showed-up on a continuous spectrum background. If the temperature was lower, reversal of the sodium lines took place. By careful adjustment of the temperature of the tungsten sphere, a point was reached when all trace of either bright or dark lines disappeared. This balance could be effected within a range of a few degrees. The corresponding temperature of the sphere was then determined by means of an optical pyrometer.

The spectrum-line method has found practical application in the determination of the temperature of a carbon monoxide flame burning in oxygen; and a series of curves has been obtained for various carbon monoxide and oxygen mixtures. It is pointed out that a noteworthy feature of this method of measuring temperature is that it is devoid of "time lag," and so, for example, may prove of value in measuring temperatures in the explosion cycle of an internal combustion engine.

A study has also been made of the electrically heated wire method of measuring flame temperatures. The effect of using wires of different diameters has been ascertained, and the magnitude of the error due to absorption of radiation by the flame has been determined.

PHOTOMETRY.

In the Photometry Division a number of investigations are in progress relating to light standards and photometric methods. Much time has, the Executive Committee state, been given to the study of problems arising in the use of photometric integrators. For most purposes mean spherical candle power is now the standard measurement of a source of light; and the effects of the form of the integrator, and of the selective absorption of the paint used for coating its internal surface, have been carefully investigated. Reports on this work have been published.

For measuring the reflection factor of road surfaces, the sample is mounted on a movable truck fitted with levelling screws, and is carefully screened from stray light. The light source is a 3 KW. lamp capable of being raised and lowered as required, so that the angles of incidence can be determined for any value between 20° and 87°. The angle of view can be carried from 80° to 87°.

RUST PREVENTION.

Experiments on crude lanoline as a protection for steel surfaces against rusting have been concluded. The general result of the tests is to show that crude lanoline, which is at present largely a waste product in the woollen industry, is as efficient a protection against rust as the best imported petroleum grease, and is much less expensive. It may be used either as a grease or deposited from various solvents.

ILLUMINATION RESEARCH.

Work of the Illumination Research Committee of the Department of Scientific and Industrial Research is at present in progress on several lines, including a study of glare problems arising in connection with street lighting; other problems connected with the lighting of highways; the artificial illumination of picture galleries; the measurement of the surface temperature of illuminating glassware; and the study of the reflection characteristics of road materials.

TEST ON THE CROZIER RETORT.*

This report forms the fifth of the valuable series of investigations carried out by the Department of Scientific and Industrial Research on plants for the low-temperature carbonization of bituminous coals. It describes a test carried out (April 4-9, 1927) on a unit Crozier retort erected in the grounds of the British Empire Exhibition at Wembley.

The retort (the design of which is based largely upon that of a similar plant erected in Burma, which the inventor, Mr. R. H. Crozier, claims to have operated, with considerable success, with Burmese oil shales) is of a continuously-working vertical type; of cast-iron throughout; and consists of two parallel walls 15 in. apart joined by semicircular ends. The length of the retort is 15 ft. and the greatest width 5 ft. At each of five levels are three inclined cross-flues passing through the retort from one flat side to the other, and three offtake pipes are situated at each of four levels in the same vertical planes as the cross-flues. These offtakes are carried into the centre of the retort, and are hooded. The material to be carbonized is fed intermittently into two hoppers at the top of the retort, and normally is extracted continuously into a water-sealed coke chamber by means of a rotating helix driven by an electric motor. In the present instance no electric power was available, so that extraction was carried out intermittently by hand; also no seal had been fitted, so that considerable air leakage took place into the retort during this test.

The retort is enclosed in a brickwork chamber divided into superimposed compartments or flues communicating with each other and with the inclined cross-flues according to a particular arrangement. Heating gases are supplied to the setting from a furnace burning either solid or gaseous fuel and communicating with the lowest heating space.

The coal used for the test was a Scottish non-coking splint coal (Hawkhill seam of the Tullygarth Colliery, Clackmannanshire), crushed and screened so that only about 4 p.ct. passed through an inch screen, and showing on analysis (as charged) moisture 11·4 p.ct., volatile organic matter 34·0 p.ct., ash 10·4 p.ct., and calorific value 11,160 B.Th.U. per lb. Steam was injected into the retort during carbonization to the extent of about 7 p.ct. by weight of the coal charged.

The temperature of carbonization varied from 820° C. at the base of the retort to about 280° C. at the top. It is pointed out that a temperature of 820° C. is very high for a cast-iron retort, and that for prolonged runs a special metal would be necessary to give any reasonable life.

With regard to fuel consumption on the setting, of the total of 129,000 c.ft. of gas made during the test, 123,000 c.ft. were burned in the furnace, and in addition 15·2 cwt. of coke were fired (a total of 30·6 therms per ton of coal carbonized); but it is stated in mitigation of this factor that the setting was in the open, that it contained only one retort, and that it was not in a very good state of repair.

The throughput of the retort was claimed to be 10 tons of oil shale per day, but the actual average throughput of coal obtained during the test was slightly less than 4 tons per day. Difficulties encountered during the test were mainly those occasioned by the holding-up or "bridging" of the charge in the retort, resulting in very variable rates of carbonization and necessitating a considerable amount of poking from the top of the retort with a 15-ft. steel rod. The yields of products obtained per ton of *dry* coal are summarized as follows:

Coke, 15·4 cwt.
Gas, 23·9 therms.
Tar, 16·4 gallons (containing 0·8 gallons crude spirit).
Ammonium sulphate, 9·1 lbs.

The coke or "smokeless fuel" was not completely carbonized (the volatile matter being 14·6 p.ct.). It was found to ignite easily in the domestic grate and give a good fire, but was not entirely smokeless. A 3-cwt. sample on screening showed 17·4 p.ct. of breeze (below ½-in. mesh).

The gas yield obtained during the test was 6555 c.ft. per ton of coal (as charged) at an average calorific value of 323 B.Th.U. per c.ft.; but as analyses showed the gas to contain over 50 p.ct. of nitrogen (due to leakage of air into retort at bottom), it appears that under normal conditions the actual yield would be in the region of 3500 c.ft. at 600 B.Th.U. per c.ft.

The yield of tar was low (owing to some extent to the faulty

* Report of test by the Director of Fuel Research on the Crozier retort installed by Mineral Oils Extraction, Ltd., at Wembley. Department of Scientific and Industrical Research; Fuel Research Board Reports, pp. V. + 21. H.M. Stationery Office, London (1928); price, 9d. net.

conditions of the plant during the test), and the properties of the tar show it to be similar to normal low-temperature tar.

The labour required on the plant appears to be excessive (one superintendent and three labourers per shift), but it is pointed out that this is due mainly to the peculiar conditions existing during the test period, and that under normal conditions two men per shift would suffice, and only occasional supervision by an engineer would be necessary.

The report is presented in the now familiar lucid and well-printed style; but the following two errata may be noted; on p. 10, line 2, for "15·4" read "17·4," and on p. 16, line 37, for "4 hours per day" read "4 tons per day."

A HOTPLATE INVESTIGATION.

OPEN GRIDS AND ATTACHABLE SOLID TOPS.

Some of the more important results obtained from a comparison of the completeness of combustion and thermal efficiency with attachable solid and grid-top cooker hotplates have, with the approval of the Director of the United States Bureau of Standards, been collated by Mr. J. H. Eiseman (their Associate Gas Engineer), and published in the pages of the "American Gas Journal." The observations set out were made over a period of several years, and in some cases were incidental to other work. A number of investigators have assisted in the collection of data which must prove of interest in view of the growing popularity in the United States of the solid top range. The increasing demand for this type has led to the manufacture not only of stoves with permanent solid tops, but of a number of separate solid tops which are so constructed that they can be substituted for, or rested upon, the grids of the open top range—thus effecting conversion at a very low cost.

These attachable solid tops are usually sold from house to house by agents, who claim for them various advantages, among which may be mentioned: They reduce the gas bill; they are safe, and produce no carbon monoxide; they are easily cleaned; the food will not burn; they double the cooking capacity; they apply an intense heat; the flames are protected from draughts; the cooking utensils are prevented from tipping; from two to four articles can be cooked with one burner; and the burners are kept clean, and prevented from clogging. The Bureau, however, received requests for advice from a number of users of these tops, who complained of irritating odours; and as such odours usually indicate incomplete combustion, and the consequent presence of carbon monoxide, it was felt that, in the interests of public health, an investigation was warranted. Only the most important matters were dealt with—namely, the effect of the attachable top on combustion, and a comparison of the relative efficiencies obtained when using the attachable solid and grid tops. It is, of course, recognized that there are upon the market ranges designed and built with solid tops which are both safe and efficient; and it is not to these appliances that the investigation refers. The grid top range employed was of a well-known make, and bore the "Blue Star" of the American Gas Association's Testing Laboratory, signifying that it had successfully met all the tests required in order to be listed as an approved appliance.

COMBUSTION TRIALS.

With the open grid no carbon monoxide was found until gas rates much higher than the normal were reached; so that this range, employed as it was designed to be, with the grid top, would not give rise to incomplete combustion under any of the usual working conditions. When, however, the grids were replaced by the attachable solid top, and the same method of testing—that is to say, with all four burners in use at the same time—was applied, an extremely dangerous quantity of carbon monoxide was found at the normal rate of gas consumption. One of the claims for the attachable top is, however, that a meal can be prepared with only a single burner in service; and therefore a comparison of the two conditions was made with only one standard burner in use. In this case, again, it was necessary to go much beyond the normal gas rate to find carbon monoxide when using the grid; whereas the normal consumption with the solid top in place produced carbon monoxide above the limits specified by the American Gas Association Testing Laboratory as an allowable amount.

With the solid top in place, the only exit for the products of combustion is at the front of the range. The air for combustion, however, must also enter at the front; and as it is retarded by the burned products, the supply to the burners is considerably reduced; and may be contaminated by products of combustion. The primary air is also reduced when the solid top is used, because the burners are heated to a higher temperature. Such a reduction of the air supply causes carbon monoxide to be formed at a rate that may result in serious risk to the user of the range. One manufacturer of an attachable solid top, whose attention had been drawn to the dangerous character of his appliance, endeavoured to eliminate the risk by making outlets for the products of combustion at the back and along the edges. The top so modified was tested repeatedly; the outlets being enlarged after each test. But though this process was carried to such an extent that the appliance became hardly recognizable as a solid top, and any advantages it might originally have possessed in regard to appearance, convenience, or protection to the burners had been sacrificed, it still adversely affected the aeration of the flame.

EFFICIENCY TESTS.

Efficiency tests of a very complete character were next undertaken; and the results of these went to show that: (1) Boiling temperature cannot be maintained in any utensil on a portion of the top under which no gas is being burned; and (2) the maximum temperature rise secured in utensils above the unlighted burners is not more than 70° Fahr. when the range is operated in a normal manner for a period of 1¼ hours. When the utensil above the lighted burner was placed directly in the hole formed by removing the lid, the efficiency was 34·3 p.ct., as compared with 39·3 p.ct. obtained with the grid top, or a decrease of 12·7 p.ct. The use of the lid above the lighted burner reduced the efficiency from 34·3 p.ct. to 18·8 p.ct. When two of the four burners on the stove were used under the solid top, the efficiency was 37·3 p.ct., or about 5 p.ct. lower than that obtained with the grid.

In short, in no case under the conditions of this investigation could the cooking efficiency obtained with the attachable solid top equal that of the grid top. The only advantage in the use of such a solid top arises when several dishes are being prepared at the same time, and some require longer to cook than others. Those which are finished first can then be kept warm by setting them back on the top during the remainder of the cooking process. This does not necessarily mean an increase in efficiency, but is merely a convenience.

NOTES ON NEW BOOKS.

THE BERGIUS PROCESS.

The history and present state of development of the Bergius process for the so-called liquefaction of coal are written in concise and handy form in a new booklet by Dr. Walter Friedmann, entitled "Die Verflüssigung der Kohle nach Fr. Bergius," which has just been published by the Allgemeiner Industrie-Verlag, G.m.b.H., of Berlin NO 43, Neue Königstrasse 5. In their foreword, the publishers refer to the great attention which is being given in these days to continual improvements in new methods of oil synthesis. Equal, if not greater, interest attaches to the well-known discoveries of Bergius. Quite apart from their technical success, no one can deny they provided much of the incentive to intensified research on kindred subjects. The prominence given to such subjects in the recent technical literature of all nations suggested the appropriateness of putting on record an up-to-date account of the pioneer Bergius process; and this has been provided by Dr. Friedmann's little work. The history, the theory, and the practice are clearly described, comparisons drawn with contemporary processes, and the significance discussed of oil supplies independent of outside sources. The book, in paper cover, is published at Mk. 4, post free. Translation rights are strictly reserved.

OVENS FOR COKE WORKS AND GAS-WORKS.

The publishers—Wilhelm Knapp, of Halle (Saale)—have sent us a new volume by L. Litinsky, of Leipzig, entitled "Kokereiund Gaswerksöfen." This constitutes No. 17 of their "Kohle Koks Teer" series. The author, in his preface, calls attention to the dearth of reference books dealing with industrial ovens in general, and with ovens for coal distillation in particular. He has certainly made a big effort to remedy the latter deficiency, and has incorporated in a massive volume a large amount of carefully compiled detail on a subject with which he is well qualified, by long practical experience, to deal. Many phases of the subject are treated—various systems, the choice of method, construction, and working, waste-heat recovery, &c. The text is well illustrated, and 149 diagrams are included, as well as 32 tables. The subject-matter is handily indexed for reference. The volume is published at Mk. 21 in paper cover, and Mk. 22.80 bound.

MR. H. H. GRACIE'S PRESIDENTIAL ADDRESS.

North British Association of Gas Managers, April 13.

(*Continued from p* 174.)

It is significant to note that electricity was introduced into Edinburgh in 1895, and that, while its popularity and progress grew apace, the demand for gas was also steadily making headway. However, after 1902, the year of commencing production at the new works at Granton, the advance was slow indeed; and it began to look as if it had reached its zenith, notwithstanding that about this time, and for some years after, the price was reduced to 2s. 9d., and eventually in 1912 to 2s. 8d. per 1000 c.ft., which is the lowest rate so far reached for gas in Edinburgh, but one which we are fast approaching again. The price of coal had also fallen to an average of a little over 10s. per ton.

Effect of the Incandescent Burner and Mantle.

It has to be remembered that, during the preceding years, the effect of the reduced consumption of the incandescent burner, due to its higher efficiency, was being felt; and it probably reached its greatest effect about this time. It was just near this period also that the flat-flame public stairlight burners were converted to incandescent, passing only 1 c.ft. per hour; the public lamps having been gradually changed to this type a few years previously, and set at 2½ c.ft. per hour.

Adoption of a Forward Policy.

In 1912 the Gas Commissioners began to realize that it was essential to examine closely the financial position and the prospects of the undertaking; and to that end they called for a report from each of their Chief Advisors—viz., the Consulting Engineer, the Engineer and Manager, the Treasurer, and the Clerk. The result of this investigation and the reports submitted led to the adoption of a "forward policy" which included the lending out and fixing free of cooking appliances (which up to that time had been hired-out), the hiring and hire-purchasing of gas fires and radiators, the continuance of reduced rates for gas used for power and certain industrial purposes; and at the same time it was decided to join the "B.C.G.A."

The question of charging for gas on the 100 c.ft. unit, instead of the 1000 c.ft. one, with a view to bringing it more into line with the charge for electricity, was also debated; but this did not find favour with the majority. While the price of gas remained the same—viz., 2s. 8d. per 1000 c.ft.—an immediate increase in demand was noticeable, and this continued up to the outbreak of war. After that, business began to fall off up to 1917-18, when the demand again took a turn for the better; and, notwithstanding the fact that the price had been advanced to 5s. 8d. per 1000 c.ft.—owing in large measure to the rise in the price of coal (to 26s. 4d. per ton) and in wages (over 100 p.ct.)—the demand continued. This was partly assisted by the coal strike of 1921, during which, owing to the shortage of raw coal, the demand for gas was particularly heavy and continuous; the supply being maintained with difficulty, and only by large purchases of coal from America.

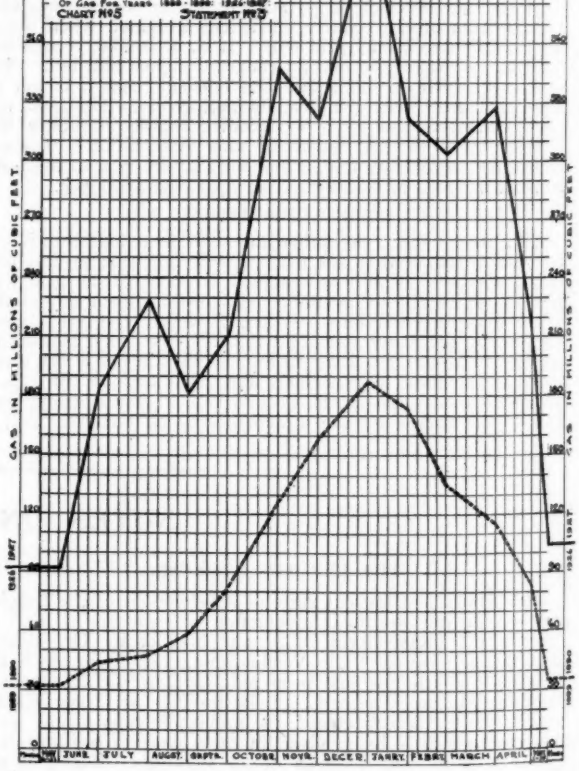
Progress under the Edinburgh Corporation.

At the end of 1920, the Gas Commission was absorbed by the Corporation of Edinburgh, and from that time onwards, under the direction of the Gas Committee, the progress has been remarkable. The make has increased by no less than 851 million c.ft., equivalent to 35 p.ct., and the price of gas has been brought down from 5s. 8d. (1s. 1·6d. per therm) to its present price of 3s. 2d. per 1000 c.ft. (equal to 7·6d. per therm) a reduction of over 44 p.ct., leaving it only about 18½ p.ct. above the lowest pre-war price. This represents the lowest rate charged for gas during the last twelve years. The average price of coal has fluctuated between 26s. 4d. and 17s. 10d. per ton within the period mentioned. It, however, actually reached an average of 36s. 10d. in 1926-27, owing to the coal dispute from May to November, 1926. Partly on account of that dispute, the make of gas increased during that year by 342 millions, or nearly 12 p.ct., up to a total of 3289 millions—a record figure. This makes Edinburgh about the fifteenth largest producer of gas—on the thermal basis—in the United Kingdom. The figures quoted above will be found in Statement No. 2, a superficial study of which makes evident the great fluctuations in price. It is not difficult to realize how these must interfere with steady business and the uniform growth of the industry. They also emphasize the need for a stabilized rate on which industrial concerns can make up their estimates and charges.

It is somewhat significant, and shows very forcibly the present advance, that during the past nine years—*i.e.*, since the Armistice—the increase in output, equivalent to over 50 p.ct., has been actually greater than it was during the previous thirty years. This is in large measure due to strenuous and continuous effort towards greater economies, higher efficiencies, and a steady drop in the price of gas from 5s. 8d. to 3s. 2d. per 1000 c.ft. An intensive campaign—combining special showroom displays, cookery demonstrations, exhibitions, and publicity—was also carried out. Advertising propaganda calling attention to the advantages of gas, with an attractive programme for hiring and hire-purchasing of gas apparatus, was united with the existing loan scheme for cooking appliances. At the same time an endeavour was made to get into direct touch with consumers through inspectors and workmen and by letter, in order to ascertain their problems, and assist in their solution. The continuous effort to bring home to the people the ruinous effects of smoke and soot on the public health, vegetation, buildings, &c., and the great benefits to be derived from pure air, food, and unobstructed sunshine, has contributed in no small measure to restrict the quantity of coal burned in the open grate, by the substitution of either of the smokeless fuels, coke or gas. To the foregoing must be added the provision of a gas of uniform quality at a suitable pressure, the speedy following up of complaints, and the keeping of consumers' appliances in proper order.

Monthly and Weekly Consumptions.

You might now consider Charts Nos. 5 and 6 and Statement No. 3, which show very clearly the period of the year wherein the greatest advance has been made. To enable you to follow this easily, the consumption for each month has been plotted for years 1888-89 and 1926-27. We see that, whereas in June, 1888, the consumption was 46 millions, by 1926 it had risen to 185 millions, equal to 302 p.ct. advance. In July the increase represented was from 45½ to 230 millions, equal to 411 p.ct. advance; and August, 243 p.ct. Here I might call attention to the falling-off in consumption now in August as compared with July, which was not apparent forty years ago, and I think can only be attributed to the greater favour of holidays at the end of July and during August. In September the advance equals 184 p.ct., and in October 194 p.ct.; it then descends rapidly until in November and December it is respectively only 108 p.ct. and 132 p.ct. This evidences conclusively that the bulk of the



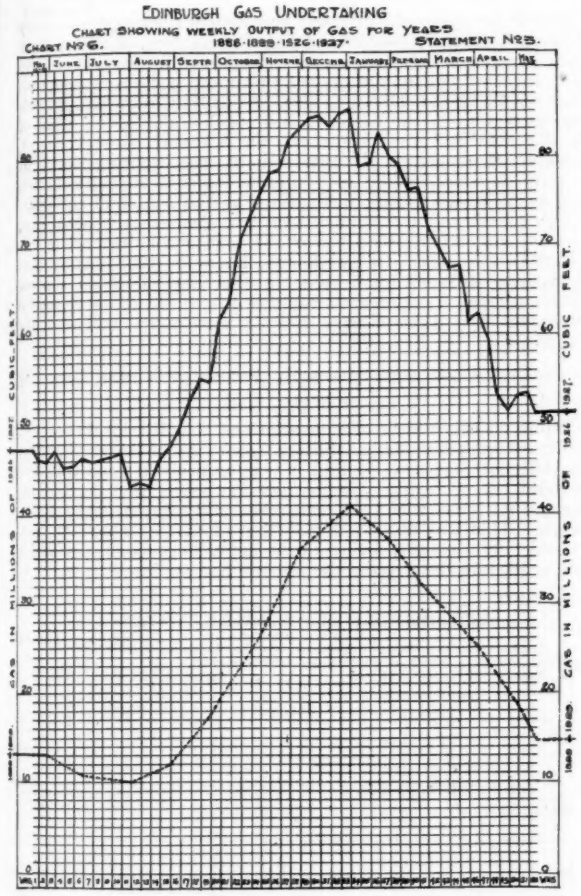
increase has been secured during the light or summer months, and must be largely attributable to the great number of gas cooking appliances then in use.

Great Advance in the Summer Load.

If attention is now given to the distribution of the output of gas over the various weeks of the year, to ascertain how the advance in demand has spread itself over the different periods,

the figures will be found in Statement No. 3 and in Chart No. 6. Our full records in this direction only extend back to 1905, so that the comparative progress over the 22 subsequent years is apparent. The increase in the months of May, June, and July are again most marked; the demand having doubled, or more than doubled, in 22 years. The advance from 19,526,000 c.ft. in first week of July, 1905, to 46,488,000 c.ft. in July, 1926, being nearly 2½ times, is outstanding. This shows the great advance in cooking by gas, and the tendency to discontinue the kitchen range in the summer time or scrap it altogether, and replace it with a coke boiler, as is now becoming the established practice. In January again the increase is not so heavy, being only from 55,875,000 c.ft. in 1906 to 80,402,000 c.ft. in 1927, or about 44 p.ct. more, which proves that, even at that time of year, any falling-off in lighting due to the incandescent burner and other causes has been fully made up, and considerably added to by heating and cooking.

If we estimate from Chart the minimum weekly output



which occurs in July, 1888, and compare it with the maximum weekly output in December of that year, we find the figures are approximately 10 million and 41½ million c.ft. respectively —that is, 4½ times the amount of gas was sent out in December as compared with that in June. Turning to the corresponding figures for 1926, we see that in July the minimum week was 46 millions, and in December the maximum 85½ millions, or barely twice the amount in winter as in summer, showing graphically how the summer load has been successfully cultivated, the curve flattened, and the discrepancy between summer and winter demand reduced. It also indicates that the summer load has been increased to 4½ times what it was in 1888, and that this load is now greater than that of the winter in 1888, and the winter one advanced to a little more than twice the summer one.

Greater Use of Manufacturing Plant.

This again demonstrates the greater use which is being made of the manufacturing plant, owing to the heavy load preponderating over a much longer period of the year, and the extended time it is actually under fire. This period of less idle time for the plant is, of course, an added advantage as far as utilization of capital is concerned. It also illustrates distinctly the shorter period now available to get the plant into proper order for the winter load, and the heavier responsibility devolving on those in charge of the works.

Shorter Period Left for Repairs to Plant.

Taking three-quarters of the peak load as representing the average safe load for the plant, we find that the demand equals or exceeds this for 26 weeks of the year, leaving the other 26 weeks for repairs and reconditioning, practically from April to September inclusive. In 1888 the corresponding figures were 16 weeks in commission and 36 weeks for repairs—say, March to mid-November inclusive—indicating how the demand has

STATEMENT No. 3 —(Charts Nos. 5 and 6.)

Weekly and Monthly Outputs of Gas in Thousands of Cubic Feet.

Weekly Outputs in Thousands of Cubic Feet.				Monthly Outputs in Thousands of Cubic Feet.			
Weeks.	1905-06.	1926-27.		1888-89.		1926-27.	
1	28,198	46,595		16-31		16-31	
2	21,501	46,180	16-31 May.	May .	28,054	May .	92,775
				June .	46,233	June .	184,932
3	20,465	47,332		July .	45,564	July .	229,670
4	19,209	45,419		Aug. .	53,701	Aug. .	181,589
5	19,096	45,532		Sept. .	75,478	Sept. .	213,394
6	19,701	46,649		Oct. .	118,537	Oct. .	347,146
			June.	Nov. .	155,252	Nov. .	321,724
7	19,526	46,040		Dec. .	182,056	Dec. .	423,556
8	19,255	46,488		Jan. .	166,349	Jan. .	323,031
9	19,851	46,581		Feb. .	127,960	Feb. .	304,410
10	19,725	47,153		March .	113,695	March .	328,591
				April .	81,810	April .	217,951
11	19,452	43,408		1-15		1-15	
			July.	May .	30,657	May .	104,902
12	21,407	43,842					
13	22,483	43,824					
14	23,495	46,215					
15	26,057	47,708					
			Aug.				
16	28,091	49,808					
17	28,477	52,846					
18	31,675	55,580					
19	32,555	55,160					
			Sept.				
20	36,062	62,082					
21	39,296	64,482					
22	42,805	70,328					
23	45,192	73,997					
24	49,065	76,257					
			Oct.				
25	51,912	78,292					
26	54,877	78,316					
27	57,704	81,907					
28	59,649	83,209					
			Nov.				
29	58,973	84,691					
30	59,523	84,720					
31	61,119	83,452					
32	62,727	85,288					
33	59,198	85,495					
			Dec.				
34	59,938	79,506					
35	58,598	79,836					
36	57,463	83,287					
37	55,875	80,402					
			Jan.				
38	53,764	79,465					
39	52,496	76,261					
40	50,097	76,705					
41	47,946	71,979					
			Feb.				
42	44,581	65,914					
43	44,129	67,451					
44	40,468	67,504					
45	38,738	61,491					
46	34,659	62,231					
			March				
47	31,782	59,551					
48	30,858	53,661					
49	27,598	51,388					
50	27,954	53,351					
			April.				
51	26,319	53,673	1-15				
52	21,660	51,259	May.				

increased and persisted during the winter and spring, and how the period allowed for renovating has gradually diminished. This again points to the necessity for having a larger amount of stand-by plant to ensure safety and continuity of supply and provision against breakdown. Another important result arising from this circumstance of a shorter period being available for repairs is the heavy and intermittent demand this makes on the labour market. This term is used in its widest sense to include both skilled and unskilled men, but more especially the former. There is also the urgency for quick delivery of material within a strictly limited period. This militates against getting the work done speedily, if all gas-works are busy at repairs during the same season of the year, and tends to increase unemployment during the winter months. It is therefore emphatically the duty of every engineer and manager to consider this important question with a view to forecasting spring and summer requirements as early as possible, and getting everything that can possibly be ordered duly in hand in winter time, and any repairs started at the earliest opportunity thereafter. This is a question which is becoming acute not only for those in charge of gas-works, but for the manufacturers and repairers of plant, who are gradually feeling the stress of all these repairs arising at one time, and the continuous demand to have work carried out speedily and before a certain specified

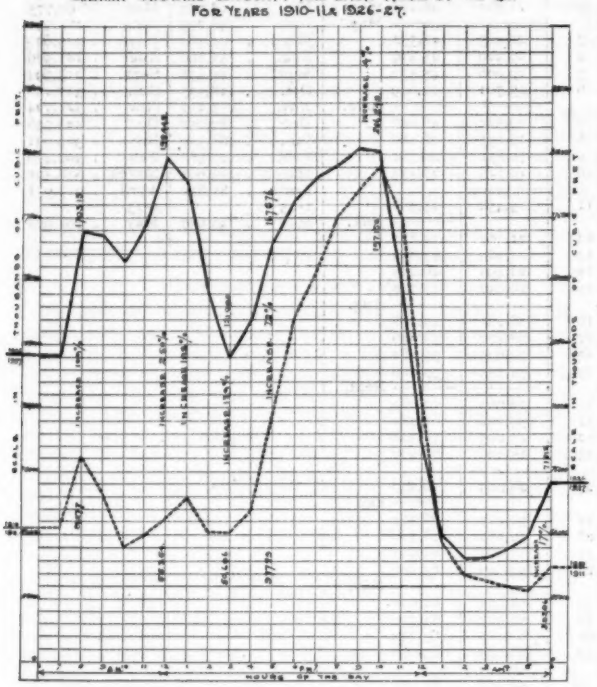
date, to be in readiness for the autumn and winter loads. The matter is one for careful consideration and thought in the interests of all concerned.

GAS SENT OUT DURING EACH HOUR OF THE DAY.

Let us now ascertain how the quantity of gas used during the 24 hours of the day has varied, taking for comparison the total used during each of the hours as applied to the years 1910-11 and 1926-27. Another chart is given (No. 7) to illustrate

CHART No 7. STATEMENT No 4.

EDINBURGH GAS UNDERTAKING.
DIAGRAM SHOWING CONSUMPT FOR EACH HOUR OF THE DAY FOR YEARS 1910-11 & 1926-27.



this. Our records in this direction only extend back to 1910-11, but they show at a glance how the load has increased during the morning, forenoon, and afternoon hours, and how it has remained almost stationary in the late evening and early morning—say, from 9 p.m. to 3 a.m. The development from 10 a.m. to 1 p.m. is probably the most striking, bringing out as it does the great extent to which gas is made use of for cooking purposes. The figures for each hour are given in Statement No. 4, from which it will be observed that over the period in question—a matter of 17 years—the 10 a.m. to 11 a.m. load has risen from 47,938,000 c.ft. in 1910 to 173,043,000 c.ft. in 1926-27, or nearly four times as much, and from 55,354,000 c.ft. to 198,449,000 c.ft. between 11 a.m. and 12 noon, again nearly four times.

You will notice, also, that the noon load in 1910-11 was only about one-quarter of the night load—say, about 10 p.m.—but

STATEMENT No. 4.—(CHART No. 7.)

Consumptions of Gas for each Hour of the Day in Cubic Feet. For Years 1910-11 and 1926-27.

[Uncorrected.]

Hour.	1910-11.	1926-27.
	C.Ft.	C.Ft.
7 a.m.	57,817,000	120,044,000
8 ,,	81,227,000	170,315,000
9 ,,	65,553,000	169,896,000
10 ,,	45,096,000	157,548,000
11 ,,	47,938,000	173,043,000
12 noon	55,354,000	198,449,000
1 p.m.	64,809,000	189,505,000
2 ,,	50,296,000	145,614,000
3 ,,	50,606,000	121,098,000
4 ,,	60,638,000	136,074,000
5 ,,	97,789,000	167,576,000
6 ,,	135,898,000	182,653,000
7 ,,	155,644,000	190,360,000
8 ,,	176,198,000	200,682,000
9 ,,	190,264,000	217,054,000
10 ,,	197,150,000	206,248,000
11 ,,	170,074,000	155,239,000
12 midnight	97,484,000	86,621,000
1 a.m.	47,122,000	50,297,000
2 ,,	34,279,000	43,071,000
3 ,,	33,546,000	42,028,000
4 ,,	31,830,000	45,546,000
5 ,,	31,873,000	49,767,000
6 ,,	38,286,000	71,812,000

is now almost equal to it. The figures are: In 1910-11, 55,354,000 and 197,150,000 c.ft. for noon and 10 p.m.; and in 1926-27, 198,449,000 c.ft. and 206,248,000 c.ft. respectively, proving how successful we have been in our object to flatten out and equalize the load throughout the day, and how we have fully maintained our evening consumption. The extra demands for gas for cooking the breakfast, lunch or dinner, tea, and the evening lighting load are clearly marked, as also the changes which have occurred in them as a result of development. These advances have necessitated adjustments in the pressure to meet the varying demands.

Chart No. 7 will be of special interest to those who have been considering the value and incidence of the lighting load, and whether that load is of importance, and, if so, what value it is to the undertaking. It will no doubt surprise those who have experienced their greatest demand at some other period of the 24 hours.

MAXIMUM AND MINIMUM LOADS—DECEMBER AND JUNE.

As will be observed, the chart and figures refer to a summary of the whole year, but in addition Charts Nos. 8 and 9 have been constructed for representative days in December and June covering the maximum and minimum periods of demand. That for Thursday, Dec. 22, 1927, shows that the evening peak load at 6 p.m. is the highest, and considerably above that of the day load at 8 a.m. to 9 a.m. On Tuesday, June 21, 1927, however, the position is reversed, as the lighting load at 10 p.m. is small, owing to "summer time," the peak occurring at 12 noon, as would be expected at that season of the year.

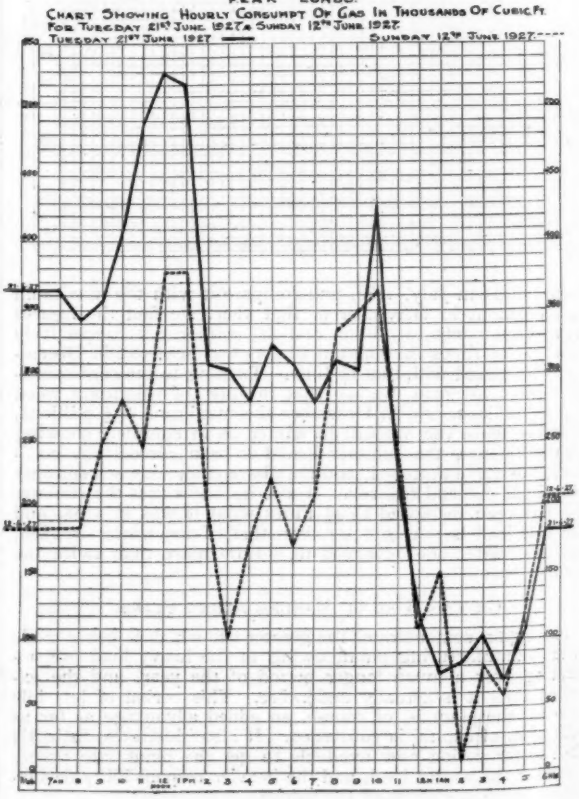
The question of the Sunday load has also received attention, as I understand in some towns the maximum demand is obtained on that day. In Edinburgh, however, the consumption on Sunday is much below that on other days, both as a peak and as a total. The nearest Sunday outputs to those given on December and June Charts Nos. 8 and 9 are included for comparison.

QUANTITIES USED FOR DIFFERENT PURPOSES—CHEAP GAS FOR INDUSTRIAL USE.

While on the subject of consumptions, I will take the opportunity of analyzing the quantities taken over a period of years for different purposes. I find it was only about 1909 that the demand for a cheaper rate of gas for power and certain industrial purposes was fully recognized and catered for in Edinburgh. This was met by a reduction of 5d. per 1000 c.ft., advanced to 6d. in 1923, owing to the increasing use of gas under this head, and the success the scheme had achieved.

CHART. No 8.

EDINBURGH GAS UNDERTAKING.
PEAK LOADS.
CHART SHOWING HOURLY CONSUMPT OF GAS IN THOUSANDS OF CUBIC FT. FOR TUESDAY 21ST JUNE 1927 & SUNDAY 12TH JUNE 1927.
TUESDAY 21ST JUNE 1927 —— SUNDAY 12TH JUNE 1927 - - - -



This cheap gas is not sold without restriction—indeed, it is a stipulation that it has to be taken in approximately equal weekly quantities, and chiefly during daylight hours, so that the heaviest demand may not arise during the peak load—*i.e.*,

during the heaviest lighting hours. The gas so used is also subject to discounts and rebates for large quantities, and for prompt payment of accounts; so that the rate under the best conditions may come down to about 2s. 2d. per 1000 c.ft., or a little below 5d. per therm, or even less, which places gas in a very favourable position to compete with solid fuel and other forms of energy. We have also an extra special rate of 4d. per therm for gas used for steam-raising purposes.

Chart No. 10 shows the consumptions year by year for industrial purposes. These are also given in Statement No. 5, with the percentages of total output. This table brings out that in 1909-10 the quantity sold for power and other industrial uses was 26 million c.ft., equal to only 1·36 p.ct. of the total gas sold; and that by 1919 the quantity had advanced to over 181 millions, or 9·05 p.ct. For the last completed year—viz., 1927—the grand total was nearly 258 millions, but had fallen in percentage to 8·42, owing to the rapid growth in other directions. This must be considered good progress for a city

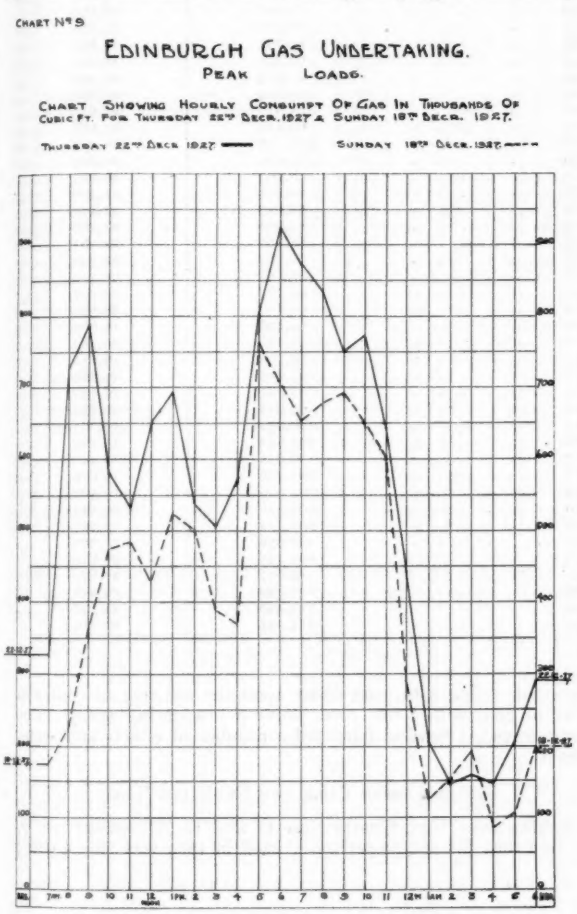


CHART No 9
EDINBURGH GAS UNDERTAKING.
PEAK LOADS.
CHART SHOWING HOURLY CONSUMPT OF GAS IN THOUSANDS OF CUBIC FT. FOR THURSDAY 22ND DECR. 1927 & SUNDAY 18TH DECR. 1927.
THURSDAY 22ND DECR 1927
SUNDAY 18TH DECR. 1927

like Edinburgh, which is not a manufacturing or industrial town in the true sense of the term, but rather a residential one.

Prepayment Consumers.

The gas taken by consumers through prepayment meters also shows a rapid advance from 1903 onwards. Up to that time this form of meter had not been in particular demand; and, owing to the additional costs of meters, upkeep, recording and collecting, and the relatively small consumption per meter, it was necessary to make a fairly high additional charge, which began at 1s. 2d. extra per 1000 c.ft., but has been gradually reduced with increased use. It is now 6d. per 1000 c.ft. over the ordinary domestic rate. This, however, is again under consideration, with a view to further reduction to 5d. In 1903, 25 million c.ft. per annum were taken through slot meters. This represented only 1·41 p.ct.; but it has steadily grown, until last year it reached the splendid figure of nearly 380 millions, equivalent to 12·4 p.ct. of the total gas sold. The number of meters of this type now in use is 21,748, compared with 92,486 ordinary meters, and equals 19 p.ct. of the whole. The foregoing data will be found on Chart No. 10 and Statement No. 5.

I am aware that these figures are much below those in some other parts of the country; but there is not the same demand for prepayment meters in a residential city as in an industrial one. The average quantity of gas used per prepayment consumer has now reached the respectable total of 17,460 c.ft. per annum, having increased from 11,530 c.ft. in 1923.

Gas Used in Public Lamps and Stairlights.

The quantity of gas used in public lamps and by stairlights (which is shown in diagrammatic form in Chart No. 10) is particularly interesting, and shows how incandescent lighting, combined with economies, due partly to better lighting, and partly to the policy of extinguishing a number of lamps at midnight, and the introduction of automatic lighters, has

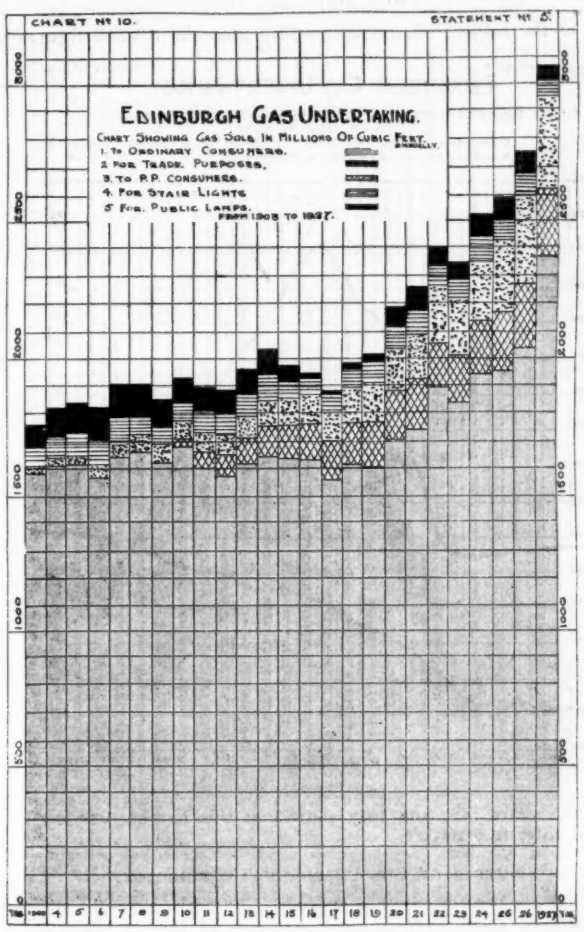


CHART No 10.
STATEMENT No 5.
EDINBURGH GAS UNDERTAKING.
CHART SHOWING GAS SOLD IN MILLIONS OF CUBIC FEET.
1. TO ORDINARY CONSUMERS.
2. FOR TRADE PURPOSES.
3. TO P.P. CONSUMERS.
4. FOR STAIR LIGHTS
5. FOR PUBLIC LAMPS.
FROM 1903 TO 1927.

affected the amount of gas sold for these purposes. The records extend back to 1903. In that year, as shown in Statement No. 5, as well as Chart No. 10, the gas burned in public lamps amounted to over 89 million c.ft., equivalent to 5·03 p.ct., and that used in stairlights (which were then nearly all flat-flame) to over 74 millions, equal to 4·2 p.ct.—a total of 164

STATEMENT No 5.—(Chart No. 10.)

Gas Sold Yearly for Various Purposes, C.Ft, from 1902 to 1927.

Year.	Ordinary Consumers.	Prepayment Consumers.	Power and Industrial.	Public Lamps.	Stairlights.
1902 .	1,581,555,100	15,709,700	..	87,789,400	71,576,800
1903 .	1,588,488,500	25,094,400	..	89,576,100	74,682,000
1904 .	1,608,672,500	30,841,400	..	93,260,200	78,923,200
1905 .	1,612,112,000	37,080,000	..	98,710,600	83,456,300
1906 .	1,585,485,000	42,594,900	..	108,523,700	86,858,500
1907 .	1,651,422,100	51,687,500	..	112,713,600	90,198,400
1908 .	1,620,481,500	60,045,200	..	91,630,100	82,607,200
1909 .	1,635,094,300	65,847,400	..	87,037,600	71,503,700
1910 .	1,681,967,200	71,538,500	26,401,200	83,391,800	75,416,100
1911 .	1,611,609,000	70,628,000	60,159,400	82,660,000	67,811,900
1912 .	1,584,025,400	73,403,600	78,840,100	80,372,100	66,544,100
1913 .	1,636,726,100	81,055,400	93,728,400	82,464,200	66,581,000
1914 .	1,660,947,700	91,180,600	114,411,600	83,491,400	66,843,600
1915 .	1,649,077,700	97,884,500	120,411,500	51,519,600	66,399,700
1916 .	1,649,535,200	108,301,400	133,020,100	2,679,100	52,495,400
1917 .	1,567,388,000	113,904,100	135,771,600	1,022,300	52,375,500
1918 .	1,616,948,300	133,101,000	170,719,500	2,390,500	52,494,200
1919 .	1,602,643,100	153,112,100	181,758,100	14,403,100	55,911,500
1920 .	1,704,348,800	172,704,500	194,736,700	56,110,400	67,476,400
1921 .	1,756,140,950	182,248,700	187,370,300	56,310,250	67,782,300
1922 .	1,895,746,100	207,621,400	175,050,000	56,596,200	61,665,800
1923 .	1,849,262,000	202,724,950	177,622,600	59,050,150	71,679,000
1924 .	1,9[illegible]5,741,750	227,595,360	199,027,200	64,844,610	71,762,480
1925 .	968,155,907	174,894,320	214,730,960	69,694,005	71,546,208
1926 .	2,014,358,761	108,623,410	236,441,700	75,480,130	71,437,335
1927 .	2,277,799,896	379,813,660	257,950,426	76,503,302	71,519,513

millions, or 9·23 p.ct. of the total sold. The amount taken for these purposes reached a maximum of 203 millions, or 10·6 p.ct., in 1907. From that year it gradually declined, and during the war period, owing to the almost entire absence of street lighting, the percentage of gas used fell, in 1917, to 2·85 p.ct. of the total. After that it gradually rose again, until last year

the public lamps consumed 76½ millions, or 2·4 p.c., and the stairlights over 71½ millions, or 2·3 p.ct.—together 148 millions, or 4·7 p.ct. of the total sold. Gas for public lighting is now charged at 2s. 7d. per 1000 c.ft.

Unaccounted-for Gas.

On the subject of unaccounted-for gas, the relative figures

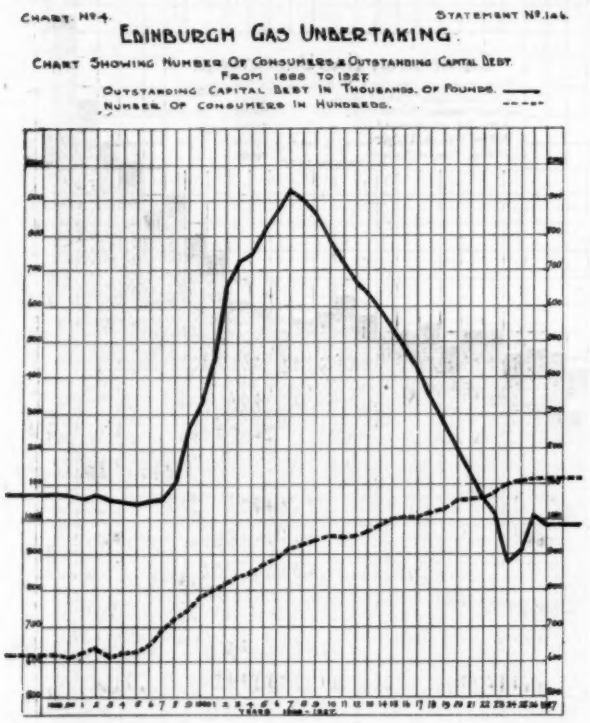


Chart No 4.
Statement No 1&6.
Edinburgh Gas Undertaking.
Chart Showing Number Of Consumers & Outstanding Capital Debt
From 1888 to 1927.
Outstanding Capital Debt In Thousands Of Pounds.
Number Of Consumers In Hundreds.

for the years 1889 and 1927 show that this has been reduced from 10·57 to 6·16 p.ct.

Number of Consumers and Consumption.

From the records (Statement No. 6, Chart No. 4) we find that in 1888-89 there were 61,290 consumers of gas in the area, and that in 1927 the total had risen to 114,234. This is an increase of 86 p.ct., which compares with an augmented output of 168½ p.ct.; so that the additional use of gas per individual will be at once apparent. The figures give an average per consumer of 15,869 c.ft. in 1889, and 26,819 c.ft. in 1927—an advance of 10,950 c.ft., equivalent to nearly 70 p.ct.

While the number of consumers has been steadily ascending, it will be observed from Statement No. 6 that the consumption per consumer was a fairly stationary and regular quantity—omitting the war years—up to 1920-21, from which time the demand per consumer has steadily increased, reaching its maximum at the present time.

Residual Products.

The returns from residuals and an examination of the varying quantities produced, with the prices obtained for them,

STATEMENT No. 6.—(Chart No. 4.)

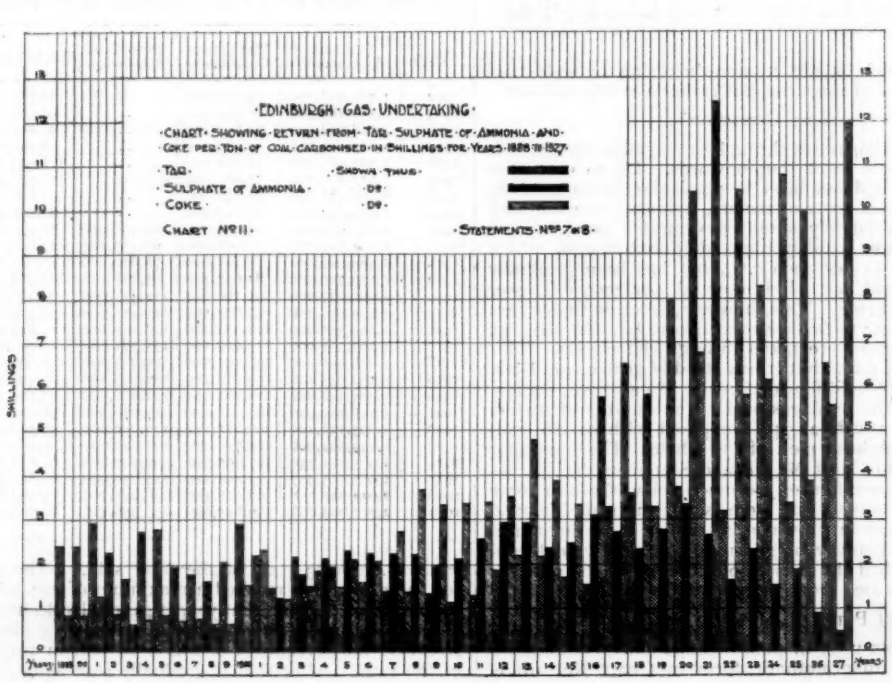
Number of Consumers and Gas Used per Consumer—1889 to 1927.

Year.	No. of Consumers.	Average Quantity of Gas Used per Consumer per Annum.
		C.Ft.
1889	61,920	15,869
1890	61,117	18,692
1891	62,972	19,690
1892	64,191	18,892
1893	61,397	19,927
1894	61,913	20,393
1895	63,009	21,685
1896	65,347	21,645
1897	69,483	21,682
1898	72,598	21,321
1899	74,964	21,804
1900	78,403	21,967
1901	80,405	21,770
1902	82,057	21,425
1903	84,060	21,168
1904	86,089	21,063
1905	88,162	20,796
1906	89,884	20,314
1907	92,165	20,708
1908	93,233	20,564
1909	94,578	19,689
1910	95,262	20,383
1911	95,570	19,831
1912	95,875	19,663
1913	97,687	20,093
1914	99,225	20,350
1915	100,454	19,793
1916	101,742	19,160
1917	101,632	18,440
1918	103,770	19,079
1919	104,049	19,309
1920	107,418	20,449
1921	107,724	20,890
1922	107,958	22,200
1923	109,153	21,624
1924	110,677	22,850
1925	111,230	23,366
1926	112,430	24,338
1927	114,234	26,819

also their relation to, and effect upon the net cost of coal and price of gas, will, I feel sure, prove a fascinating study. For this purpose, I have constructed a number of charts and statements.

Returns from Coke and Price per Ton.

Taking coke first, Charts Nos. 11 and 12, Statement No. 7, we find that the return per ton of coal in 1889 was only 9·92d.;



in 1893 it fell to 7·21d.; and fluctuated over the first twelve years between this (the lowest figure touched) and 1s. 5·42d.,

STATEMENT No. 7.—(CHARTS NOS. 11 AND 12.)

Return from Coke per Ton of Coal Carbonized and Price of Coke per Ton—1889 to 1927.

Year.	Return from Coke per Ton of Coal Carbonized.	Average Price of Coke per Ton.	Average Price of Coal per Ton.
	s. d.	s. d.	s. d.
1889	0 9·92	..	11 9·83
1890	0 10·29	..	11 7·80
1891 (railway strike)	1 2·94	..	16 0·96
1892	0 10·64	..	18 6·34
1893	0 7·21	..	17 1·05
1894	0 8·90	..	13 3·54
1895	0 11·11	..	12 10·14
1896	0 8·80	..	11 7·83
1897	0 9·15	..	11 2·54
1898	0 8 27	..	10 9·08
1899	0 8·28	..	10 11·62
1900	1 5·42	..	12 9·52
1901 (coal strike)	2 3·88	..	16 11·56
1902 (new works at Granton started)	1 2·95	..	14 2·27
1903	1 5·98	7 4·8	13 1·96
1904	1 10·62	7 2·5	13 0·92
1905	2 1·66	7 3·1	12 4·59
1906	2 1·15	7 0·8	12 1·47
1907	2 7·63	7 6·7	11 7·81
1908	3 8·30	10 6·7	14 0·11
1909	3 3·11	10 0·8	12 6·22
1910	3 3·07	9 3 9	10 0·14
1911	3 4½	9 8·1	10 4
1912	3 6	9 10·6	10 4
1913	4 9	12 2 5	11 0·4
1914 (great war)	3 10	12 0·82	13 6
1915	3 3	8 11½	12 9·6
1916	5 9½	14 6	15 3·5
1917	6 7	18 1·87	18 2
1918 (armistice)	5 10	18 1	19 6
1919	8 0½	25 2 8	22 4
1920 (amalgamation)	10 3	34 1·32	26 4
1921 (coal strike)	12 5½	42 6·4	34 9
1922	10 6	33 8·2	35 2
1923	8 3	22 4	22 1
1924	10 10	30 6·7	24 7
1925	10 0	29 7·83	23 8
1926 (coal dispute)	6 7	20 10·1	20 9
1927	11 11	32 9·6	36 10

which was reached in 1900. One is immediately tempted to ask the reasons for the small return in the earlier years. It must have been due to two or three causes:

(1) The limited demand for coke as a fuel; its usefulness having been but scantily recognized.
(2) The small amount available for sale consequent upon the large quantity used for firing the furnaces, boilers, &c., at the works.
(3) The large percentage of shale used which yielded no coke.

As these matters received closer consideration, and higher efficiencies were obtained, combined with the use of a lower grade of fuel for boiler firing—consequent on forced-draught furnaces being adopted—and coincident with the value of this product as a fuel becoming more generally recognized and appreciated, the price advanced, and at the same time the amount available for sale. Over the next ten years to 1910, the return from coke varied from 1s. 3d. up to as high as 3s. 8d. per ton of coal; and for the following ten years to 1920, the yield showed a steady and substantial advance, reaching 10s. 3d. per ton of coal in that year.

From 1920 to the present time, the value has shown considerable variations, being as high as 12s. 5½d. in 1921 (the year of the coal strike), and 11s. 11d. in 1927—the period affected by the protracted coal dispute. It had, however, fallen as low as 6s. 7d. in the immediately preceding year (1926), when we experienced an exceedingly mild winter. Coke stocks accumulated to considerable dimensions both in this country and on the Continent, and the commodity became almost unsaleable at any price. The figures and the charts show that there is a fairly close relationship between the price of coal and that of coke. Again, by the use of economical furnaces on both retort settings and boilers, the amount of fuel for sale can be increased. The quantity available for disposal can also be kept within required limits by the judicious use of water-gas plant. The fluctuations in the price of coke year by year are shown on Chart No. 12, and Statement No. 7. These vary from 7s. 4d. in 1903 to 42s. 6d. in 1921. Our records are not complete back to 1888, but we have a note that in 1889 some coke was sold for shipment at only 4s. 6d. per ton.

A critical examination of the prices of coal and coke reveals that, after disturbances and upheavals caused by strikes and disputes, they eventually return to their economic value in competition with other fuels and with other sources of supply.

The variations in the prices of coal, coke, &c., emphasize the great losses which accrue to the community through disputes and misunderstandings, which result in much money going out of the country at a time when it is most needed, and in higher prices having to be paid for essential commodities. As already pointed out, the economic law of supply and demand

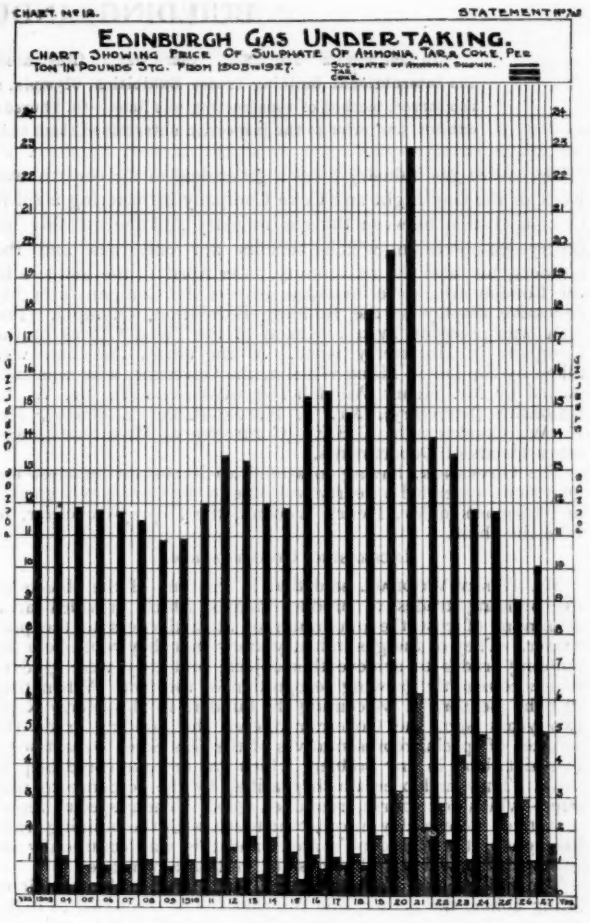


CHART No 12.
STATEMENT No 7
EDINBURGH GAS UNDERTAKING.
CHART SHOWING PRICE OF SULPHATE OF AMMONIA, TAR & COKE, PER TON IN POUNDS STG. FROM 1903 TO 1927.
SULPHATE OF AMMONIA SHOWN.
TAR
COKE.

eventually holds sway. They also suggest that the true and reasonable way of settling differences is for both parties to get together in a proper spirit, and endeavour to understand each other's point of view. Then there is greater likelihood of a mutually satisfactory settlement, with in mind the country's needs, and our dependence on the foreign market for an outlet for our goods, as well as the competition which has to be met, in order to maintain, and if possible extend, these markets.

(To be continued.)

Synthetic Ammonia Production in France.

Judging from figures in a recent issue of our esteemed contemporary, the "Journal des Usines à Gaz," the manufacture of synthetic ammonia appears to be spreading far more widely among the colliery undertakings of France than in this country. Seven companies in the Nord and Pas-de-Calais coalfields have an annual output of over 45,000 metric tons; two undertakings in the Loire basin produce 3600 metric tons each; and collieries in the Tarn and the Lorraine fields have a capacity of 3600 and 4000 metric tons respectively. The total is 59,800 metric, or 58,855 English, tons. The favoured processes are the Claude, the Patart, and the Casale.

Reports of Gas Associations for 1927.

The volume of "Reports of Gas Associations for 1927," which has just been published by Walter King, Ltd. ("GAS JOURNAL" Offices, 11, Bolt Court, Fleet Street, E.C. 4), price 10s. 6d. net, contains the full proceedings, reprinted from the "JOURNAL," at the meetings of the various Associations of England, Scotland, Wales, and Ireland. The book is one of nearly 700 pages, being practically twice the size of the issue for 1926, during which year, of course, the coal strike seriously interfered with the normal proceedings of the different Associations. To those desiring a compact and permanent record of the important meetings held last year, the volume is essential. Lists of officers and members of the Associations are included.

Wales and Monmouthshire District Institution.—A meeting of the Association will take place in the Drill Hall, Tredegar (Mon.), on Thursday, May 3, when the chair will be taken by Mr. D. Walter Davies, who will deliver his Presidential Address. There will also be a discussion on a paper entitled "Present-Day Problems," by Mr. T. A. Canning, F.C.S. There will be luncheon at the Castle Hotel, by invitation of the Chairman and members of the Tredegar Urban District Council, and a visit to the Markham Colliery.

BUILDING INDUSTRY AND GAS.

In last week's "JOURNAL" there was an illustrated description of the Gas Light and Coke Company's display at the International Building Trades Exhibition, Olympia, one of the aims of which is to show the architect and builder the correct method of constructing gas flues. On Thursday last the Company invited the builders of London to see this exhibit, and prior to the inspection entertained them at luncheon at the Head Offices in Horseferry Road.

The entire gas industry owes a great deal to the constructive work of the Gas Light and Coke Company in fostering a spirit of co-operation between the gas industry and the building industry—co-operation which benefits not only gas and the builders, but also the community. On April 19 the builders in the London area were invited to inspect the Company's highly educative display at the Building Exhibition, Olympia. The visit was preceded by a luncheon at the Head Offices of the Company in Horseferry Road. At the outset the chair was taken by Sir David Milne-Watson, the Governor, who was supported by Mr. Henry Woodall (Deputy-Governor), Mr. W. L. Galbraith (Secretary), Mr. T. Hardie (Chief Engineer), Mr. F. W. Goodenough, C.B.E. (Controller of Gas Sales), and other Heads of Departments.

The Governor, having to attend an important business engagement, extended a hearty welcome to the Company's guests, and then asked Mr. Henry Woodall, the Deputy-Governor, to take the chair.

Increasing Co-operation.

Mr. Henry Woodall said that it was one of the objects of the building trades to produce homes which provided at a minimum of cost the maximum of attractiveness to the purchaser. They of the gas industry knew that they could help the building trades to achieve this object; and they were glad to find a constantly growing recognition of the fact. When they had the pleasure of welcoming the builders to Horseferry Road two years ago, the Governor offered the building trade the services of special representatives of the Gas Sales Department, to assist them in any problem which gas or coke could help to solve. They had been much gratified by the response to that offer—which, of course, remained good. Their special representatives were to-day in constant touch with the building trade throughout the Company's area; and this was continually resulting in considerable business of mutual advantage.

The gas cooker, the gas copper, the gas fire, the gas circulating boiler, the geyser, and the coke boiler combined to make the new home labour-saving, cleanly, comfortable, and convenient to a degree, at a cost in construction and equipment less than that of the old-fashioned home with its bugbears of drudgery and dirt. It was no longer necessary—it was no longer in accord with common-sense—for the builder to provide expensive coal-fired apparatus with large flues and costly settings which the modern housewife did not want and would not use, so that her husband had to purchase or hire from the gas company up-to-date appliances to stand in front of or beside the rejected makers of work and soot.

To-day the builder could provide a ventilated recess for the gas cooker and its companion water heater, gas or coke-fired to choice; a copper that needed no brick setting; pipes of adequate size to and under each hearth; built-in gas fires instead of grates in many of the rooms; and flues designed for the sootless products from gas fires for every room in the house but one—and he had built an "ideal home" at a good deal lower cost than if he had followed the custom of ten years ago.

Properly Designed Gas Flues.

Not the least of the economies that he would have effected was that secured by the provision of properly designed gas flues, instead of the ordinary 9 in. by 9 in. coal-fire flue. But it was of great importance that the gas flues should be properly designed and constructed from fireplace to terminal. This was the particular point which the Company's exhibit at Olympia this year had been arranged to make clear and to afford information upon, as they had found considerable lack of knowledge on the subject, leading to most undesirable results. Not just any passage up through a brick wall ending anywhere, anyhow, would do for carrying away satisfactorily the products from a gas fire. A flue designed on definite principles and constructed on practical lines must be provided, and could be provided with economy to the builder and satisfaction to the subsequent occupier.

Up to the present, however, no bye-laws had been provided to govern the construction of gas flues; and with the object of placing at the service of the builders knowledge on the subject which had been obtained from experiences throughout the country, they have been fortunate enough to obtain the assistance of Mr. Walter Tapper, A.R.A., the President of the Royal Institute of British Architects, who had prepared a series of five detailed drawings, embodying suggestions for the satisfactory construction of gas flues which were displayed, on large scale, on their exhibit at Olympia. A pamphlet had been issued, entitled "Gas Flue Construction," which embodied reproductions of these drawings, and also Mr. Tapper's written suggestions for the planning and construction of gas flues.

While, as they would readily understand, the gas industry welcomed the introduction of this special gas flue at the same time they were anxious that it should be recognized that the gas fire flue called for the same consideration in its design and erection as did the coal fire flue, from which it differed only in internal area. Suggestions would be found in the pamphlet as to the minimum permissible flue area for each size of gas fire; and, if Mr. Tapper's advice were followed, they were satisfied that all new houses in which gas flues were constructed would be thoroughly satisfactory, with regard both to economy in building costs and to increase in the cubic contents of the labour-saving home.

The gas fire to-day was almost too well-known to need any advocacy or introduction to his audience. Its popularity had been steadily increasing for some years; and it was not too much to say that it was rapidly becoming in universal demand. Last winter, the Gas Light and Coke Company installed over 50,000 fires in its area alone—many for architects and doctors. This popularity was easily explained by the real service the gas fire gave in reducing labour, increasing convenience and comfort, and eliminating the fog nuisance. This increasing popularity of the gas fire accounted for the growing interest in gas flue construction; and he would take the opportunity of offering once again the Company's advice and service to any builder in any gas flue problem that might arise. They had established considerable laboratories at Watson House, Nine Elms Lane, where every facility was available for demonstrating and testing not only gas flue construction, but all types of apparatus. The laboratories and testing shops there were always available for the assistance of builders.

A Necessary Warning.

He would take the opportunity of uttering a necessary warning. There were, unfortunately, unscrupulous manufacturers of appliances who, to enable them to obtain advantage over their competitors, made claims which were not justified. For example, there were manufacturers of geysers who informed builders and others, by advertisement or otherwise, that because of some special arrangement in their apparatus it was unnecessary to provide a baffle and flue to ventilate the machine. They were naturally able to claim that this provided a direct saving over the geyser fitted with proper ventilating arrangements. The gas industry strongly deprecated any such claims or suggestions. Every geyser must consume a considerable amount of gas in a short time, and was generally fitted in a relatively small bathroom. For these reasons it was absolutely imperative that a properly constructed baffle and flue, having a direct and efficient outlet into the open air, should be fitted in every case. If any claims or suggestions to the contrary were made to builders, the Company would be very happy to give them the benefit of their knowledge and experience, and if necessary to carry out any sort of flue tests that might be desirable in the laboratories and shops at Watson House. He asked them to bear this offer—and warning—very carefully in mind. The Company attached great importance to the matter.

It only remained for him to thank them for their presence, and to remind them that the services of a specially trained staff were always at their disposal to assist them in deciding any questions relating to the use of gas for lighting, cooking, heating, water heating, or refrigeration—the latest, and a very successful, application of gas to the needs of the community. Mr. Woodall, having again expressed appreciation of the active co-operation the Company were receiving from builders in all parts of London, and having assured them how ready the Company are to reciprocate and to render any service in their power, proposed health and prosperity to the building trades, and coupled with the toast the names of Mr. R. L. Roberts (President of the London Master Builders' Association, Mr. A. H. Adamson (Vice-President of the Institute of Builders), and Mr. F. L. Dove (Hon. Vice-President of the National Federation of Building Trades Employers).

Mr. Roberts, replying to the toast, said that the building industry had not always shown that co-operation with the gas industry which it might show; but he was pleased to think that there would be greater co-operation in the future.

Mr. Adamson expressed appreciation of the efforts of the Gas Light and Coke Company. It was his privilege recently to visit the Company's showrooms in Church Street, Kensington, which not only were an object lesson to the gas industry, but must raise the aspirations of the public. It was a fine building, and it would engender a desire on the part of the public to instal good gas appliances, and also to decorate their homes more tastefully. He felt that the building industry was in need of greater publicity, and they would do well to adopt the methods of the Gas Light and Coke Company as exemplified in their Kensington Showrooms.

Mr. Dove, in a brief reply, said that the gas industry was undoubtedly making residences more attractive to the public, and was in this respect helping the builders.

LOW-TEMPERATURE CARBONIZATION.

Discussion at a Meeting of the Institution of Engineering Inspection.

Paper by R. P. Wilson and C. H. Parker.

At a Meeting of the Institution of Engineering Inspection which took place at the Royal Society of Arts, Adelphi, on April 13, under the chairmanship of Mr. A. H. Foyster, Mr. R. P. Wilson, C.B.E., M.Inst.C.E., presented a paper on "Low-Temperature Carbonization" which he had written in collaboration with Mr. C. H. Parker. The paper was a lengthy one, and Mr. Wilson contented himself with a résumé illustrated by many lantern slides depicting various low-temperature carbonization systems.

A great deal of abuse, said Mr. Wilson, has been hurled at the open domestic grate. No doubt much of it is well deserved, but it may be said without fear of contradiction that the well-designed domestic grate, burning the right kind of smokeless fuel, is still, and apparently always will be, the most satisfactory and healthy, as well as the most comfortable, means of heating an ordinary living room.

"Coalite" and the Gas Industry.

He then went on to discuss how the "right kind of smokeless fuel" may be produced—in other words, the manufacture of "Coalite" by the Parker process of low-temperature carbonization. Having remarked that the Gas Light and Coke Company have embarked on the construction of two low-temperature plants in collaboration with the Fuel Research Board, Mr. Wilson suggested that any gas undertaking could, with advantage, use low-temperature retorts for the purpose of producing gas of high calorific value for enriching purposes, instead of using oil for this purpose, as at present. The present practice, he observed, appears to be to generate a low value gas of 350 B.Th.U. per c.ft., and to "enrich it by the expensive and complicated method of carburetting oil. In the process a hard low-volatile coke is provided, which is not popular as a domestic fuel, because it does not ignite readily, and is subject to other criticisms. It is freely admitted that low-temperature coke is smokeless, and is in every way suitable for use in domestic grates, as well as for what are now known as anthracite stoves. Many years ago when 'Coalite' was first introduced, the gas companies stated emphatically that they could make an exactly similar product, that the idea was not new, and that they knew all about it. If they had done what appeared to them then to be such a simple matter, it may safely be stated that the Committee on Smoke Abatement would never have been called into existence."

Various Low-Temperature Processes.

Mr. Wilson then dealt *seriatim* with the following low-temperature carbonization processes: Midland Coal Products, Ltd.; "K.S.G.;" "Salermo;" McEwan Runge; Dvorkovitz; "Fusion;" "Carbocoal;" Marshall-Easton; Plassmann; Sutcliffe; and Illingworth. Regarding the Dvorkovitz system, which was described in the "Journal" for Jan. 18, p. 145, he admitted that it is ingenious, but he offered the following criticisms:

(1) The initial stirring has the effect of powdering some of the material, leading to the production of very fine coke.
(2) If the coal is carbonized in the "preheating chamber," the stirrer would have a great danger of seizing in any strongly swelling mass.
(3) The tar oils are not likely to be produced in much greater quantities than in usual low-temperature processes. The residual fuel will not be so valuable; and as the whole of the heating of the retorts is done by producer gas—*i.e.*, by other means than by the rich coal gas produced—the process will thereby be much less economical.

The Marshall-Easton process he considered unnecessarily complicated, and he spoke of the quenching disadvantages of the "Carbocoal" system, the coke discharge difficulties of the Plassmann plant, the paddle troubles of the "Salermo" unit, and what he thought were the too generous heating provisions of the Sutcliffe plant.

The Ash Problem.

In the concluding stage of his remarks Mr. Wilson spoke of the Bergius process, but not in any complimentary or enthusiastic manner. Prior to this, however, he discussed the ash problem. Coal, when carbonized, he said, produces roughly 70 p.ct. of the original weight in coke; but this 70 p.ct. will contain the whole of the ash or dirt in the coal. "The maximum permissible ash content of the coal is 5·6 p.ct., but it should not exceed 3·5 p.ct. If it contains more than this maximum, the cost of cleaning must be added to the price of the coal. Unwashed smalls, which can be bought for 8s. per ton at the pit, will contain 20 p.ct. of dirt, or more. If the cost of transport be taken to be 5s. from the pit to the works, and the cost of washing 1s., the cost of the coal as delivered will be 14s. for 16 cwt. of coal, or 17s. 6d. per ton. Washed smalls from the same colliery, containing not more than 5 p.ct. ash, would not cost more than 14s. 6d., and would, therefore, be 3s. a ton cheaper than the inferior coal, and would produce better fuel."

Discussion.

The Chairman observed that there were many people who asserted that the salvation of the collieries depended on the solution of this problem of low-temperature carbonization. Even if this was only partly true, it indicated that the problem was of great importance to all engineers. The paper had dealt comprehensively with most of the better-known processes; but the authors had not mentioned one system about which one heard a great deal at the present time. He referred to the "L & N" process. At first glance it might appear strange that there was such wide variation in the manner in which the problem of carbonization had been tackled by different inventors; but the characteristics of the raw material, coal, varied enormously, and the type of plant depended on whether gas, coke, or oil was to be the main product of the system.

Let us have Facts

Mr. W. H. Patchell (Past-President of the Institution of Mechanical Engineers) suggested that the time was not yet ripe for electricity undertakings to adopt low-temperature carbonization as part of their process. If it could be proved that low-temperature carbonization could stand by itself as a commercial success, then, perhaps, it might be a good thing to embody it in the production of electric light, heat, and power; but he thought that, at present, if the system was taken up by electricity concerns, it would distract them from their object of producing cheap current. He considered, too, that the gas undertakings of the country were of the same frame of mind. Criticizing the paper, Mr. Patchell said that the authors had assembled many pictures of different plants, but no properly dimensioned drawings, and there was no information as to the throughput, space occupied, and so on, of the various systems pictured. It was difficult to arrive at the facts regarding low-temperature carbonization systems. For instance, some time ago he saw a large scale plant on the Caracristi-Peron system operating at River Rouge. He was told wonderful tales about this; and yet, when he re-visited America, he discovered that the plant was on the scrap heap. This was only one example of what had occurred again and again in the history of low-temperature carbonization. When the authors discussed the Bergius process, they did not mention that hydrogen could convert a non-coking coal into a coking coal—a fact which might be extremely useful to the low-temperature carbonization people, and which was unquestionably of great importance. In concluding his remarks, Mr. Patchell asked the authors whether, by a low-temperature plant capable of carbonizing annually 500,000 tons of coal having a gross calorific value of 13,000 B.Th.U. per lb., they could improve on an over-all efficiency of 14,800 B.Th.U. per kilowatt-hour—a figure which had been obtained for twelve months' actual working in an electricity undertaking.

Financial Jugglery a Bar to Progress.

Mr. E. Kilburn Scott said it was a great pity that such a national problem as low-temperature carbonization should be held up by the pigeon-hole methods which had developed since the war. There was need for the pooling of information. It was a still greater pity that the science of low-temperature carbonization should be subject to financial jugglery, which was inimical to progress.

Virtues of the Parker Process.

Col. Bristowe observed that, as far as their work at Barnsley was concerned, there was no secret about what they were doing. The works at Barugh were inspected almost daily by deputations of engineers from electricity concerns, colliery companies, and so on; and during the past four months the works had been visited by over a hundred deputations representing people who were interested in the problem, not only in this country, but in India, Africa, Canada, and many other countries. At Barugh there were five batteries of retorts, four of which were in operation, and one of which was kept as a stand-by; and these four batteries were dealing with 1500 tons of coal a week supplied by six or eight collieries selected solely on account of their proximity to the plant, and not because they supplied coals which were particularly suitable for treatment. Each week 1000 tons of "Coalite," 25,000 gallons of oil, 3500 gallons of motor spirit, and between 7 and 8 million c.ft. of gas were produced. The "Coalite" sold itself, and the oil was sold without any difficulty at satisfactory prices. As a matter of fact the output was sold for months ahead. A further plant on a large scale was to be installed at a pithead in South Yorkshire, and another large plant was to be put up in Derbyshire. "Coalite" sold at prices current for good house coal. In low-temperature carbonization for the production of a satisfactory smokeless fuel, continued Col. Bristowe, it was unnecessary to resort to paddles or any other form of agitation of the charge. With such systems the throughput of the coal was not uniform, and every particle of the coal was not equally treated. Uniformity of the product was essential, because the volatile matter should be within narrow limits, and should be about 7 p.ct. The ash content of the smokeless fuel should be low, and the fuel itself should be capable of being screened and transported without undue

breakage. Indeed, the latter should not exceed 5 p.ct. To his mind all low-temperature processes which did not take advantage of the inherent compressibility of coal were doomed to failure. The Parker process was good because the correct amount of heat was applied for the right period; and the heating arrangements were under rigid control, which ensured uniformity of the "Coalite." With some processes, briquetting was necessary either before or after carbonization, and this added to the cost of the processes. Moreover—and this was an important consideration—the public did not take kindly to briquettes. Similarly, pulverizing added to the cost at which the product could be sold; and those processes which entailed pulverization were saddled by this extra cost.

Effect of Supply and Demand.

Mr. W. N. C. Clinch remarked that the ash content of a smokeless domestic fuel had to be low, and yet the success of a low-temperature carbonization system depended on the utilization of fines from the collieries, and these fines contained a great deal of ash. Consequently it would be necessary to instal some form of coal washing plant in connection with the low-temperature carbonization plant, which would add to capital cost. At present slacks were a good market for power stations, and even now prices were hardening. To-day, it had been stated, "Coalite" could be sold at the prices fetched for good house coal, but if the cost of slacks increased, the price at which "Coalite" could be sold would have to be raised.

Mr. Wilson Replies.

Mr. Wilson, replying to the discussion, said that the reason why no reference had been made to the "L & N" process was that Sensible Heat Distillation, Ltd., had no desire that it should be mentioned. Mr. Patchell had suggested that if an electricity undertaking were to embark on the sale of gas and oil, this would distract them from their main object—that of producing cheap current. He did not agree with this idea. With regard to the query whether, by the installation of low-temperature carbonization plant, an overall efficiency of 14,800 B.Th.U. per kilowatt-hour could be improved upon, this could not be answered off-hand. It required careful study. If, however, Mr. Patchell would supply him with a sample of the coal, he would investigate it in the laboratory, and then, if the results warranted this, he would try the coal in a 10-ton test, and would supply Mr. Patchell with figures based on present market prices. "Coalite" was now a commercial product; and at the same price as coal, it was actually 33 p.ct. cheaper, due to greater efficiency in use. As for the remarks of Mr. Clinch, it would be a long time before the price of slacks rose to such an extent as to make the production of "Coalite" unprofitable.

BUILDING EXHIBITION AT OLYMPIA.

[The First Notice of the Exhibition appeared on pp. 181-84 of last week's issue of the "JOURNAL."]

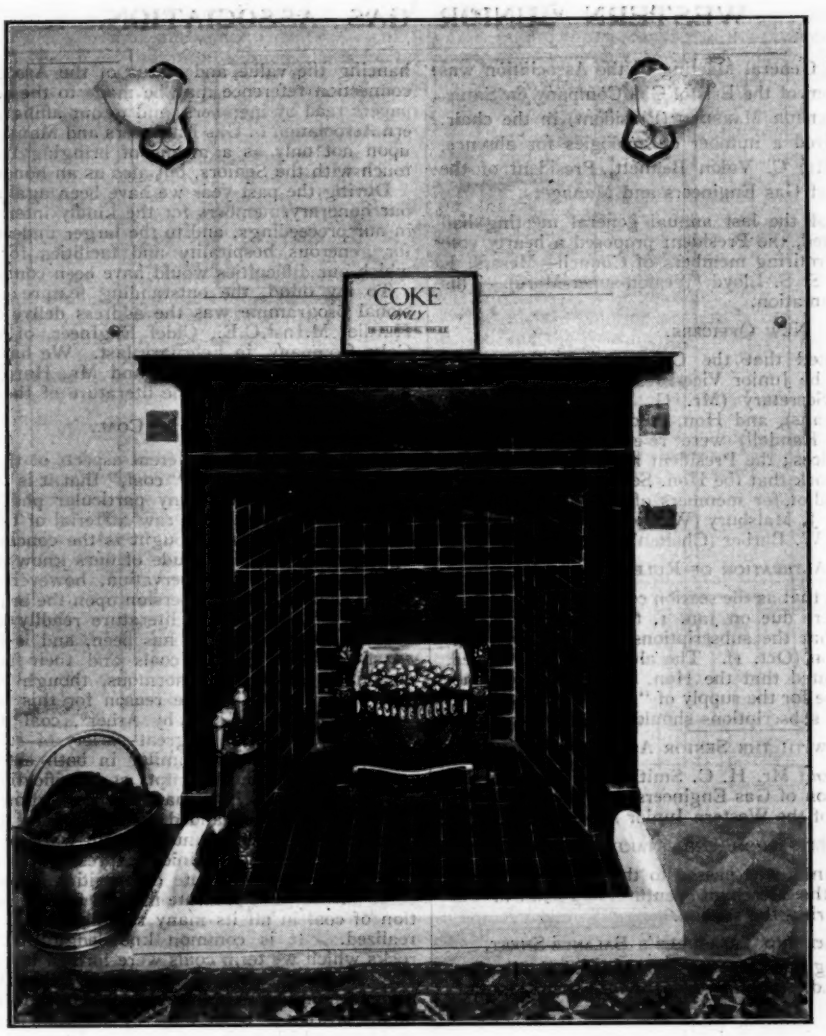
The South Metropolitan Gas Company are showing various types of "Metro" coke burning grates and stoves. In an open chimney piece in the centre of the stand a No. 232 "Metro" coke basket grate functions with efficiency and charm. It is flanked by "Metro" inset coke grates of different types. These are working exhibits, and present a brightly glowing front to visitors. Apart from the obvious efficiency of these grates, there is no doubt that the flickering flames burning on the surface of the glowing coke make a strong appeal. These "Metro" coke grates provide a very attractive means of burning coke.

The stand is a small one, and the eye quickly travels from the grates to the frieze, with its silhouette of smokeless chimney pots against a clear blue sky and the slogan "Fire without Smoke." Thus one of the main benefits to be derived from the use of coke is impressed upon the observer. A range of "Metro" independent coke fires and mantel registers fitted with coke grates is also on view.

An attractive catalogue illustrates the whole range of "Metro" coke grates, together with working drawings and instructions for fixing.

Gas Cookers and Fires.

Cookers & Geysers, Ltd., of 244, High Holborn, London, W.C., show the latest models of "Aristo" gas cookers, fitted with patent triplex boiling burners, and having oven taps provided with safety locks which prevent their accidental opening. One type of "Aristo" oven, described as a semi-closed oven, incorporates a single oven burner and bottom flue outlet; the other is totally closed, and is fitted with two burners and one tap. The cookers shown are of various sizes; and some are



A HANDSOME "METRO" COKE GRATE.

provided with two ovens—one for baking, roasting, &c., and the other for grilling—both being heated simultaneously by two burners at the sides. The firm also exhibit water heaters for big and small requirements.

The Davis Gas Stove Company, Ltd., of 60, Oxford Street, London, W., make an excellent display of cookers, geysers, "armoured" gas grates and surrounds, and gas mantel registers.

The Falkirk Iron Company, Ltd., of 76, Wells Street, London, W., draw attention to a series of new designs in mantel grates for coal or gas, "Red Knight" gas fires, "Smooth-top" gas ranges, "Pixie" gas cookers, "Falco" domestic boilers, &c.

Water Heaters.

Geysers, water heaters, and boilers are well represented by, among others, the following firms:

The British Boiler Company, Ltd., of 1, Albemarle Street, London, W.—the "Birnwell Gasco" combination, which provides for domestic hot water and central heating, and of which a gas cooker is an integral part. A serviceable hotplate is provided.

Clarkhills, Ltd., of 31, Vauxhall Bridge Road, London, S.W.—automatic gas operated water heaters, supplying unlimited hot water to various points. There is the new Clarkhill "Junior" 2½-gallon bath geyser, for those who desire a one-point machine. Another new departure is the Clarkhill storage heater, which requires as a maximum only 6 c.ft. of gas per hour to operate it.

Cochrane & Co., Annan, Ltd., of Annan—one of the larger sizes of special hot water boilers, which is a useful modification of the standard design for first-class heating schemes.

Cornes & Haighton, Ltd., of 240, High Holborn, London, W.C.—hot water installations suitable for baths fixed on ground or first floor. Also portable coppers for solid fuel or gas.

Ewart & Son, Ltd., of 346-50, Euston Road, London, N.W.—geysers of all kinds for instantly providing hot water. One of the geysers will heat 10 gallons per minute. There are inexpensive combined baths and geysers, as well as the "Boilo" gas copper, with syphonic action for bath supply.

Fenlon & Son (incorporating G. Shrewsbury & Co.), of 8, Tudor Street, London, E.C.—geysers of different patterns and sizes in various finishes, together with circulators, boilers, coppers, &c.

The Hurry Water Heater Company, of 39, Broad Street, Birmingham—a selection of specialities in the way of water heating apparatus suitable for installation on housing estates, &c.

Jones & Attwood, Ltd., of Titan Works, Stourbridge—boilers for domestic hot water supply and for central heating.

New Geysers, Ltd., of 200, City Road, London, E.C.—geysers for large and small requirements.

Ruud Manufacturing Company, Ltd., of 99, High Holborn, London, W.C.—automatic gas water heaters, storage systems, &c. There are patterns suitable for the largest as well as the smallest installations.

E. Horace Thompson, of High Pine Close, Weybridge—patent "Nocondense" water heater. This is a simple device for either supplanting or supplementing an independent boiler or kitchen range boiler. A hot water tank for an airing cupboard is encased with insulating material to conserve the heat. A suitable chamber is formed beneath for a few minute gas jets to be kept constantly burning, and a 1-in. exhaust is provided. The tanks may be connected by flow and return pipes to the coke heated boiler, when the gas can be used as supplementary only, or to make full burden in the summer months.

Miscellaneous.

Burt, Boulton, & Haywood, Ltd., of Salisbury House, London Wall, E.C.—bituminous and other paints, "Silvertown" special wood preservative, &c.

Electrolux, Ltd., of 153-55, Regent Street, London, W.—gas operated refrigerators without a single mechanical part to call for attention.

Expanded Metal Company, Ltd., of York Mansion, Petty France, London, S.W.—various specialities of the firm (and examples of their uses), including "Expamet" expanded steel reinforcement, which has been in successful and ever-increasing employment all over the world for more than 35 years.

Novocrete and Cement Products Company, Ltd., of Stonebridge Works, Park Royal, London, N.W.—a stock of gas flue blocks.

WESTERN JUNIOR GAS ASSOCIATION.

The Second Annual General Meeting of the Association was held in the Board Room of the Bristol Gas Company on Saturday, April 14, Mr. Arthur Marsden (President) in the chair. There had been received a number of apologies for absence, including one from Mr. C. Valon Bennett, President of the Southern Association of Gas Engineers and Managers.

After the minutes of the last annual general meeting had been read and confirmed, the President proposed a hearty vote of thanks to the two retiring members of Council—Messrs. J. Conway (Bristol) and S. S. Lloyd (Weston-super-Mare). This was carried with acclamation.

New Officers.

The President stated that the Council had elected Mr. Barrett, of Frome, to be Junior Vice-President for the coming session. The Hon. Secretary (Mr. G. C. Gunston), Hon. Treasurer (Mr. E. Evans), and Hon. Auditors (Messrs. F. J. Marlow and H. W. Randall) were re-elected, and heartily thanked for their services; the President making special reference to the excellent work that the Hon. Secretary had done for the Association. A ballot for members of Council resulted in the election of Messrs. J. Malsbury (Weston-super-Mare), S. B. Jones (Clevedon), and W. Barber (Cheltenham).

An Alteration of Rules.

The President stated that as the session commenced on Oct. 1, while subscriptions were due on Jan. 1, the Council proposed to alter the rule so that the subscriptions become due at the beginning of the session (Oct. 1). The alteration was carried. The President also stated that the Hon. Secretary would not hold himself responsible for the supply of "Joint Transactions" after Nov. 1, when all subscriptions should have been paid.

Affiliation with the Senior Association.

A letter was read from Mr. H. C. Smith, Hon. Secretary of the Southern Association of Gas Engineers and Managers, confirming the affiliation of the Western Junior Association.

Hospitality from Undertakings.

A hearty vote of thanks was passed to the Bath and Bristol Gas Companies, and the Merchant Venturers' Technical College, for hospitality during the session.

Secretary's Report and Treasurer's Balance-Sheet.

These reports, having been previously circulated to all members, were taken as read. The President moved their adoption, which was agreed to.

Summer Visit.

The President stated that an invitation had been received from Messrs. Waller, of Stroud, for the Association to hold their summer meeting at their works. It was decided, if possible, to incorporate a visit to the Stroud Valley.

Annual Dinner.

Proposed by Mr. Conway, and seconded by Mr. English, it was agreed that an annual dinner be arranged before the first meeting of each session.

The President considered this an excellent idea, and reminded the members that Mr. Conway had assisted materially with the various arrangements during the session, and their thanks were due to him.

Bristol Gas Company's Interest.

After the business meeting, the members were entertained at tea by the Bristol Gas Company. Upon resumption,

The President said how much they appreciated the presence of one of the Directors of the Company, Mr. Wm. Windus. They also had with them two of the hon. members—Mr. S. E. Halliwell, Secretary and Commercial Manager, and Mr. R. Robertson, Engineer, of the Bristol Company, and were pleased to welcome Mr. J. Harger Pye, of Clevedon, and Dr. M. Travers, F.R.S., of Bristol University.

Mr. Windus extended a hearty welcome on behalf of the Bristol Gas Company, and said how glad he was to see Mr. Marsden at the head of affairs.

Mr. Armitage (Senior Vice-President) then called upon the President to deliver his address.

PRESIDENTIAL ADDRESS

Of Arthur Marsden, F.I.C., M.I.Chem.E., of Bristol.

Permit me to thank you for the honour of being elected President of the Association for the past year. The office of President carries with it many responsibilities, among which the delivery of a presidential address is not the least, and it is my intention to submit to you some observations on several different points, rather than to deal fully with any particular one.

We are now near the close of our second session as a Junior Gas Association, and we may, I think, justly be proud of the progress made. The Council has missed no opportunity of enhancing the value and status of the Association, and in this connection reference may be made to the scheme of prizes for papers read by members, and to our affiliation with the Southern Association of Gas Engineers and Managers, which we look upon not only as a means of bringing us more closely into touch with the Seniors, but also as an honour.

During the past year we have been again deeply indebted to our honorary members for the kindly interest they have taken in our proceedings, and to the larger undertakings in our area for generous hospitality and facilities for meeting, without which our difficulties would have been considerable.

To my mind, the outstanding feature of an excellent sessional programme was the address delivered by Mr. Thomas Hardie, M.Inst.C.E., Chief Engineer, of the Gas Light and Coke Company, in February last. We had, on that occasion, a distinguished gathering, and Mr. Hardie's address was a notable contribution to the literature of the gas industry.

Coal.

There are so many different aspects of that complicated subject known generally as "coal," that it is very difficult to confine one's remarks to any particular phase. Probably, after realizing that coal is the raw material of the gas industry, the first result of further thought is the conclusion that very few industries of the magnitude of ours know so little about their raw material. This observation, however, must not be construed as casting any aspersion upon the brains of the industry, for, as reference to the literature readily shows, the amount of research work which has been, and is being, done on the constitution of various coals and their behaviour when destructively distilled is enormous, though we are still a long way from finality. The reason for this is, of course, plain, because, as pointed out by Arber*, coal is a purely popular term which includes a great variety of substances, unlike in geological age and dissimilar in both chemical and physical properties. Various attempts at classification have been made, of which Seyler's is perhaps the best known, while the work of Stopes, on the banded constituents of coal, was of great importance and led to much useful work by numerous investigators, so that the opinion expressed by Illingworth to the effect that "the ultimate composition of coal will finally become an easy and accurate method for the selection and utilization of coal in all its many ramifications" may eventually be realized. It is common knowledge that the carbonaceous rocks which we term coals were formed in various ways, under very different conditions, and from accumulations of plant remains belonging to many distinct classes in the vegetable kingdom, so that "it is only by a broad survey of the chief problems which each variety of coal presents that we can hope to avoid some of the pitfalls into which a hasty and narrow examination of the field might precipitate us."† The truth of this has been realized, and the published results of the Department of Scientific and Industrial Research on the Physical and Chemical Survey of the National Coal Resources‡ are of great value. In the meantime, while all this fundamental work is proceeding, we have to make as much use as possible of such methods of testing as are applicable to everyday working conditions, in order to ensure that the coal delivered to us is satisfactory for the purpose in view, and also, conversely, that any particular carbonizing process is efficiently carried out, having due regard to the type of coal to be treated. In this connection there are, in my opinion, several points which, though much discussed, are worthy of our consideration, because, while many of us may not be immediately concerned with the actual arranging of large contracts for coal supplies, yet we may be responsible for the efficient treatment of the coal when it reaches the works. The quality of the coal is therefore of primary importance; and while much could be said on the evaluation of coal in testing plants, I wish to make a few remarks on simpler everyday tests, to plead for the wider use of standardized methods of testing and analysis, and to urge the paramount importance for care in sampling. In the case of gas-works, sampling—so far as different coals are concerned—generally resolves itself into getting an average sample of a truck or number of trucks. Methods for doing this have often been described, but the point I wish to make is that sampling should be supervised by a trained person who realizes the possibilities involved, because too many unnecessary arguments undoubtedly arise due to the taking of so-called samples by either thoughtless or incompetent persons. These samples—and my remarks do not apply to coal only—are often subjected to all sorts of disturbing influences, and then suddenly assume great importance when they enter the laboratory. Everyone will agree that an untrustworthy figure is worse than none at all, because it is misleading; but when complaining of the quality—say, the ash content—of a truck of coal, perhaps the necessity for spending as much care and money on sampling as on testing is best realized by remembering that the ash test

* "The Natural History of Coal."

† Arber, *ibid.* p. 6.

‡ See also Report of Royal Commission on the Coal Industry (1925) p. 33.

is ultimately carried out on a weight of coal which is about one-millionth of the truck content, and which must represent the whole. Therefore, the larger the initial sample, the better, particularly if the coal varies in size and contains shale. Protection from weather, heat, and introduction of foreign matter during reduction of the sample must receive consideration. The reduction process is best carried out, where many samples have to be dealt with, by some form of mechanical crusher and sampler. The work of the U.S. Bureau of Mines on coal sampling well repays study by anyone interested.

Turning for a few moments to the methods of testing, in Bristol we have organized arrangements for dealing with routine samples up to one hundred per week if necessary, and the methods used are those set out by the Fuel Research Board. Many specifications and sliding-scales for the purchase of coal have been evolved. The sliding-scale on ash content would appear to be the best, because there is no such thing as a standard coal. Ash is definite, but great care must be taken when attempting to specify volatile matter content, because the gas-making value of volatile matter depends upon its composition, rather than on its precise percentage according to test. Plant tests readily show that 1 p.ct. of volatile matter in one coal is not the same as 1 p.ct. in another.

The ordinary tests for so-called proximate analysis, and particularly that for volatile matter, are empirical; and, therefore, unless the conditions and procedure are carefully standardized, the results have little value. Until such time as agreed standard procedure is evolved, the method used by those making tests should be stated when returning results. A Committee of the British Engineering Standards Association is now sitting to devise such methods, which it is hoped may eventually become international, for both sampling and analysis, but in the meantime the methods evolved by the Fuel Research Board for its own use can well be used.

In the Fuel Research Board's publication "Methods for the Analysis of Coal," the coal samples are referred to as "air-dried"; but since the water-content of such samples varies unless conditions are carefully controlled, it would appear better to compare coal assays on the dry basis. Admittedly moisture is important, because it has weight, and therefore has to be paid for, but moisture results should only be looked upon as approximate. They are generally too low on account of losses between the truck and actual test, especially during the process of grinding. Mechanical grinders, for example, readily heat up the coal, and cause large moisture loss, unless the grinding faces are carefully adjusted; in fact, where many samples are ground it may be necessary to have the grinding faces water-cooled.

Another test worthy of mention and which can be readily applied to a large number of samples is the "Swelling Number" devised by the Research Section of the Woodall-Duckham Companies.* This test, which is relatively simple to carry out, gives very consistent results with the same coal, and the information which can be collected by its means during the course of ordinary work should be very useful, if and when it becomes necessary to consider the question of coal-blending.

GAS DRYING.

The partial drying of gas before distribution has, in my opinion, come to stay, and will in the future be looked upon as a necessary stage in the production of town gas. This is due to the magnitude of the benefits derived as compared with the low cost of the treatment; the calcium chloride process, which is the most used in this country at present, costing only about 0·15d. per 1000 c.ft. treated. It would also appear that the best position for the plant is at the outlet of holders in the majority of cases, where water-sealed holders are in use, because, if the plant is placed at the inlet, the oil-film which has to be used on the tank water has, apart from cost and possible trouble by gaining access to drains, other attendant disadvantages, such as displeasing appearance on the paint of the bell, and solvent action on the tar varnishes which are frequently used on old holders—the state of these, if the tar varnish was removed, being best left to the imagination. Solution of tar varnish in the oil also tends to emulsification and disruption of the film. Also, in holders in which wooden trussing is used to support the bell, the beneficial effects of dry gas must necessarily be delayed and probably impaired by the presence of water in the woodwork.†

These remarks do not apply to waterless holders because in such cases it would be a distinct advantage to have the drying plant before storage, as emulsification and freezing of the sealing medium would be prevented and a larger range of media would be available.

In the case of pressure storage methods, such as the "Hortonsphere," drying before storage would be advantageous because internal corrosion would tend to be less. Pressure storage, however, complicates matters, since increasing the pressure raises the dew-point. Thus gas at 77° Fahr. (20° C.) contains for saturation water-vapour which exerts 17·36 mm. pressure. Assuming it is 50 p.ct. saturated, thus having an aqueous vapour tension of 8·68 mm., its dew-point is 57·3° F. If the gas is now compressed so that its pressure is raised to 15 lbs. above atmospheric, its volume will be halved and its water vapour pressure will be 17·36 mm. again. This represents saturation at 77° Fahr. once more.

The various methods available for the partial drying of gas have been enumerated in the Technical Press on several occasions* and need not be repeated here; but when examining any particular method it should be remembered that corrosion depends largely on liquid deposits and that drying to a point just sufficient to prevent deposition is the ideal, as any further removal costs extra, and more than in proportion as the ratio of the removal increases. This would clearly be the case with a refrigeration or compression process, but is also true of absorption processes in general.

The calcium chloride process is in use at one of the Bristol works, and the treatment is before storage. It is not proposed to describe the plant in detail because that has already been done by one of our members.†

A considerable amount of experimental work has been carried out on the plant, and two of the arrangements which have been investigated are shown diagrammatically below.

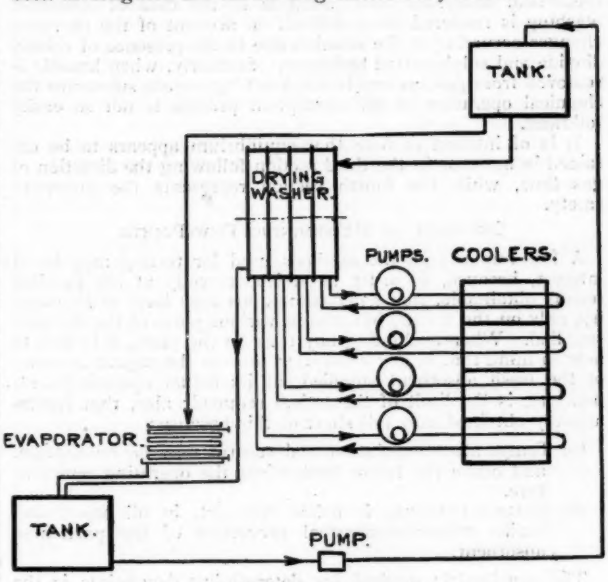


Fig. 1.—Original Arrangement.

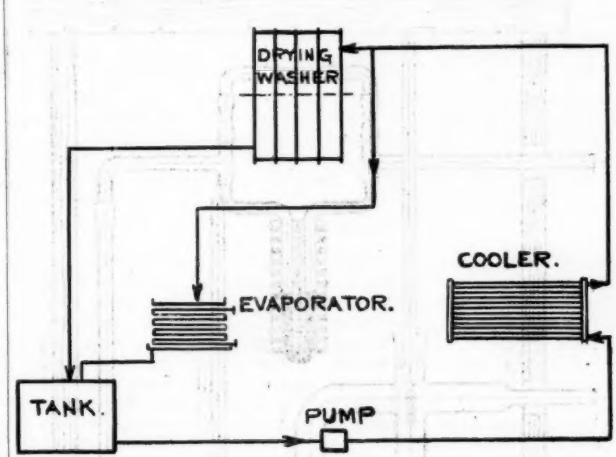


Fig. 2.—Final Arrangement.

No. 1 was the original, and was found to possess disadvantages when compared with the system finally adopted, in that four circulating pumps were used in addition to a fifth reciprocating pump for supplying calcium chloride solution continuously to the washer.

Other systems were then tried, the results indicating that a better method of working was to dissipate the heat of reaction by means of a comparatively large flow of calcium chloride through the washer, rather than to use a low flow and separate circulation through each section.

Alterations and additions have been made to the plant to allow of this, and fig. 2 shows the arrangement at present in

* "GAS JOURNAL," Coke Competition Number, Nov. 9, 1925, pp. 15-16.

† See remarks of Mr. J. Taylor, "GAS JOURNAL," Vol. 180, p. 536 (Nov. 16, p. 27).

* "Partial Drying of Town Gas," by C. Harris, "GAS JOURNAL," Vol. 180, p. 529.

† "Stapleton Road Works, Gas Drying Plant," by F. H. C. Bull, "GAS JOURNAL," Vol. 180, p. 814.

use, the obvious advantages, as compared with the earlier arrangements, being:

(*a*) Reduction in number of pumping units from five to one, with reduced wear and tear.
(*b*) The calcium chloride from evaporator is cooled before entering washer.
(*c*) Reduced number of, and simpler, pipe lines.

There is now, with the final arrangement, a greater temperature difference between the calcium chloride to cooler and the cooling water, with the result that the coolers are more efficient and yield a cooler liquor to washer. It is found that the temperature of the solution entering the washer approaches to within 1·5° Fahr. of the cooling water temperature, so that from a knowledge of the vapour-pressure of calcium chloride solutions it is possible to predict the theoretical dew-point of the outlet gas, to within (say) ± 2° Fahr., from the temperature of the cooling water. It is found that the actual dew-points correspond closely with this.

As the absorption of water vapour in this way is uncomplicated by any secondary effect, apart from that of temperature, it offers data on the performance of washers capable of definite theoretical analysis. Such analysis in the case of ammonia washing is rendered more difficult on account of the chemical changes occurring in the solution due to the presence of carbon dioxide and sulphuretted hydrogen. Similarly, when benzole is removed from gas, as one is not handling a pure substance the chemical operation of the absorption process is not so easily followed.

It is of interest to note that equilibrium appears to be obtained in our case in the third section following the direction of gas flow, while the fourth section represents the factor of safety.

METHODS OF DETERMINING DEW-POINTS.

A few remarks on the methods used for testing may be of interest, because, in order to arrive correctly at the possible results obtainable, many determinations may have to be made not only on the works, but also in various parts of the districts supplied. When evaluating any tests on the plant, it is well to bear in mind that in any absorption process the vapour-pressure of the fresh absorbent supplied, at its actual operating temperature, is the limit of theoretical removal; also, that results actually obtained may fall short of this because:

(*a*) Temperature regulation and control may be inadequate, and hence the latent heat raises the operating temperature.
(*b*) Contact efficiency is below 100 p.ct. in all cases, and varies with the physical properties of the particular absorbent.

The gravimetric method for determining dew-points is the

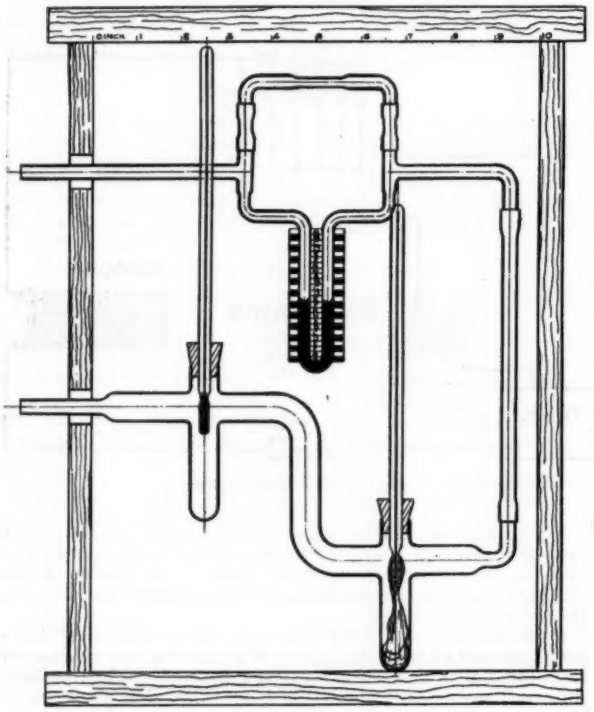


Fig. 3.

most reliable, but requires more careful manipulation than is usually considered necessary. For instance, the contents of the tube should be saturated with carbon-dioxide before use in case any calcium hydrate is present, and the same limb of the tube should always be used as the inlet. The test also requires considerable time to carry out. Alternative methods are the ether hygrometer recently described by Mr. Harris*, and the wet and dry bulb hygrometer. The ether type is not in my opinion reliable for general use with fuel gases, principally on account of the condensation of hydrocarbons. So far as the wet and dry bulb method is concerned, results which agree to within ± 1·5° Fahr. of the gravimetric figures can be obtained with suitable modification of the apparatus. The apparatus as at present used is shown in figs. 3 (sketch) and 4 (photograph), and its form was originally suggested by the flow-type ap-

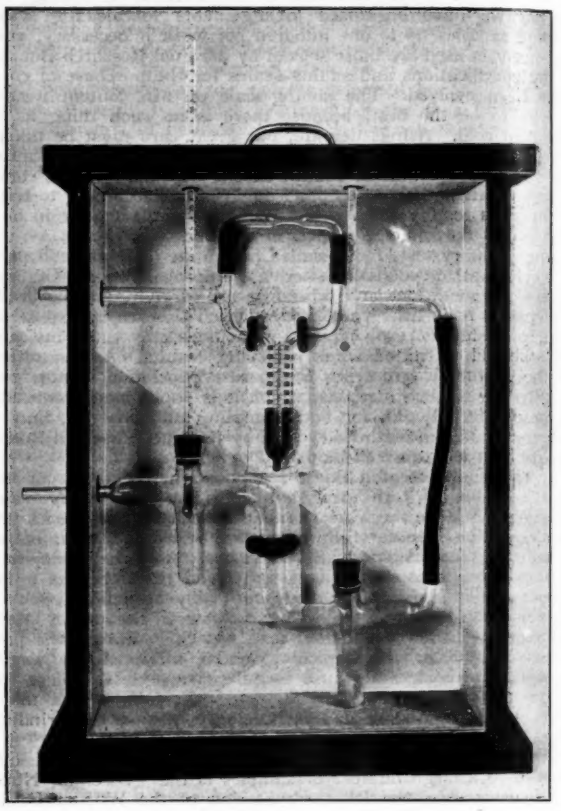


Fig. 4.—Modified Flow-Type Hygrometer.

paratus which Prof. Boys used for air humidity in connection with calorimetry.

An orifice or throat is introduced and standardized, so giving a constant flow; the latter being obtained by maintaining a constant pressure on the throat. The standardization is carried out, for each individual instrument, against gravimetric tests, and a suitable factor applied to Glaisher's tables. When the orifice was introduced, the apparatus was fitted into a wooden case with a glass front, care being taken to keep the back of the case facing the sun and wind when operating. Later, as shown in the photograph, the thermometer bulbs were screened permanently.†

It was found during the early portion of the work that actual determinations against the gravimetric method show that, though Glaisher's tables may be correct for air, they cannot be used without modification for gas-testing conditions.

However, Glaisher's formula applies fairly accurately over a working range if the factors are corrected for actual conditions of test. Outside this range the errors may be large, and even the Assman formula‡

$$p = p_w - AP(t - t_w).$$

(where t = air temperature
t_w = wet-bulb temperature
p = pressure of aqueous vapour in the air
p_w = saturation vap. pressure at temp. of wet bulb
P = barometric pressure
A = a quantity which for same instrument and certain conditions is constant, or a function depending in a small measure on t_w. "The value of A differs materially according to whether the wet-bulb is in quiet or moving air; it is in this connection that the use of a forced air stream past the bulb becomes of fundamental importance.")

which is the type of the formulæ now in general use for humidity determinations, departs considerably at high and low ranges of temperature.

* "GAS JOURNAL," Vol. 180, p. 533.

† This suggestion was due to Mr. J. Malsbury, of Weston-super-Mare.

‡ Cf. "Some Modified Forms of Hygrometers," by Dr. E. Griffiths, N.P.L. Collected Researches, Vol. 19 (1926), p. 132.

We at first thought that constant conditions were obtained in the hygrometer when a certain minimum velocity of (say) 15 ft. per second was maintained, but it was later found that for constant results the velocity must be fixed, and this is done by the differential flow-meter previously mentioned, so that when any particular instrument is used, it must be operated at the same pressure as obtained when its factor was determined.

Staff and facilities are generally available for taking observations on the works, but some means of recording dew-points on the district is eminently desirable. Some form of recorder would be preferable, but it is doubtful whether any instrument of (say) the hair type is yet sufficiently advanced for the purpose. Meanwhile, at Bristol and elsewhere investigations are being made into the merits of a recording psychrometer. It is too early to make definite assertions, but among the problems requiring elucidation in order that the apparatus may be made available for district use are simpler means of feeding water constantly to the wet bulb, and prevention of erratic readings due to deposition of hydrocarbons on the porous sleeve. Our results up to the present show that not only is a minimum flow required, but, in common with the wet and dry bulb hygrometer previously referred to, the velocity must be constant; and this involves some form of by-pass arrangement.

A point of interest in connection with the calcium chloride process was recently raised by Sperr* of the Koppers Company, U.S.A. He referred to the possible corrosive effect of minute quantities of calcium chloride spray. Mr. Harris replied† stating that no entrainment had been observed in his plant over a period of eighteen months, particularly as oil-washing for naphthalene followed the drying process.

There appears to be little in common between an air-conditioning plant of the type referred to by Mr. Sperr and a brush gas-washer, because, though the calcium chloride used may have a slight corrosive action when employed in a dilute state in presence of air, it is clear that the strong solution is not in itself corrosive, or it could not be so extensively used on refrigerating plant. A direct comparison has been made between the corrosive influence of saturated calcium chloride solution, distilled water, and weak ammoniacal solution on iron, in presence of gas containing the usual traces of oxygen. Though this comparison was not quantitative, it was made very evident that under the conditions of its use in this process the absorbing medium was considerably less corrosive than water itself. Consequently, though the amount of calcium chloride carried over may be of interest from the point of view of working costs, it does not appear to be of any other importance. However, to be quite sure on this point, some investigations were put in hand. These are not yet concluded, but the results up to the present are decidedly reassuring. Careful blank tests and controls have been made, and each test has been run on 1000 c.ft. of gas, with the following results:

Position.	Chlorides (Calculated as $CaCl_2$), Grammes per 1000 C.Ft.
Inlet to washer	*Nil*
Outlet "drier" (*i.e.*, first half of washer)	Test 1 . . . . . 0·0043 ⊙ ,, 2 . . . . . 0·0076 ×
	,, 3 . . . . . 0·0043 ⊕
Outlet washer (*i.e.*, outlet of second half, which was empty and brushes stationery)	Test 1 . . . . . 0·0032 ⊙ ,, 2 . . . . . 0·0032 ×
	,, 3 . . . . . 0·0030 ⊕
	,, 4 . . . . . 0·0036
	,, 5 . . . . . 0·0023 *
Inlet holder (before syphon and about 90 yards from plant)	0·0008 *
Outlet holder	*Nil*

The gas at washer outlet therefore contains about $\frac{1}{1500}$ lb. of calcium chloride, calculated as $CaCl_2$, per million c.ft. Each test ran for about three days, and those similarly marked ran simultaneously.

Interesting as observations on the plant itself may be, the main thing to be watched is the effect on the district; and this has presented a rather complicated problem in Bristol because three works are supplying through a system of mains which are for the most part interconnected. There are, however, several districts which are supplied almost exclusively from the Stapleton Works; and the results of syphon pumping in these areas are given below:

—	No. of Syphons.	No. Blowing.	Gallons.
February, 1927	954	411	1436
,, 1928	954	744	280

It will be seen that the amount of condensate has been reduced by approximately 80 p.ct., but actually the improvement is much greater, because the amount of 280 gallons was obtained from a very few syphons, and was largely due to inward leakage.

Close watch upon the results of syphon pumping led to the detection and correction of numerous faults in the mains, mostly of a slight nature, and generally the lime content of the water was a sufficient guide as to its origin.

The beneficial effect of the drying reached the end of the trunk mains very quickly, when the minor faults were located and remedied, even when the gas had to pass through a district holder. In fact, the re-absorption of moisture in the holders has not increased the dew-point to more than 2° to 4° Fahr.; a rise in dew-point from plant, including district holder, to the end of an 8000 yard trunk main of only 4° Fahr. being obtained.

Observations are now in progress to discover how far the beneficial effect of the drying extends in other directions of supply where the dried gas is known to mingle with that from other sources. Incidentally, when testing on the district, great care has to be taken to prevent false dew-points being obtained, since the volume of gas flowing through the apparatus is relatively small. Once this is realized, the precautions are obvious.

The matter of "complaints" is also rendered awkward by the fact that, at the moment, only a portion of the gas is dried, but it is always difficult definitely to classify "complaints" into (say) water, naphthalene, and rust.

It is well known that deposition of moisture in mains and services follows a seasonal variation, and this was illustrated by the curve for Bristol air and soil temperatures given by Mr. Harris*. It is re-produced (fig. 5, p. 252) with corresponding temperatures for New England (U.S.A.) superimposed.

Unfortunately the New England figures available have not been made in comparison with air temperatures in the way the Bristol figures were, but the curve is interesting as showing that the type of climate usually referred to as Continental can have extremes on both sides of the average greater than that of an equable climate such as we have in this country.

The deposition of naphthalene coincides with the deposition of water, and the occurrence of stoppages due to rust may conceivably, in old distribution systems, have been prevalent in the past, but to a large extent disguised by the greater number of stoppages.

It is undoubtedly a fact that when sending out undried gas all portions of the system will be at some time or other in a dry state, except perhaps in regions of persistent inward leakage. This intermittent dryness can be deduced with confidence from the curves of air and soil temperatures which were originally given in the paper by Mr. Harris, previously referred to. In such old systems the deliberate drying of the gas might result in rust deposits becoming an important matter. There is also the further trouble, apart from stoppages, of attack on meter valve faces.

The best solution is the same as for any distribution system when operating on dried gas, whether the pipes are old or new—namely, the maintenance of a film of oil on the internal surface of the pipes. The successful attainment of this condition is dependent on suitable means for intermixing with the gas at the works the small amount of oil necessary, so that the oil shall carry throughout the district, and not be deposited in the syphons near the works. Spraying could also be practised at a distance from the works, but it is to be expected that such spraying would become unnecessary when once a film of oil had been established, especially if the gas was dried at the works.

Education.

Much has been written and spoken concerning the Education Scheme during the past year, but several events of importance have happened in that time, so that it would appear advisable to review the situation. The outstanding event, of course, is the application made by the Institution for a Royal Charter. Such a mark of distinction would add considerably to the status of the body as a whole, and greatly increase the value of membership as indicating the possession of certain definite qualifications. That being so, ultimate membership of the Institution should be one of the goals of all Juniors. There is no need, at this time, to discuss in detail the regulations with respect to the various grades of membership, because they are available elsewhere, but we have heard quite a lot concerning the means by which knowledge of the ancillary or cognate subjects should be gained. I shrink from making dogmatic statements, even at this stage in the Education Scheme's career, because I feel that it is necessary to realize that perfection in formulating such a large undertaking cannot be attained in a year or two. One point which has often been discussed is that of correspondence courses. My own view is that probably, some time in the future, the Institution will, in common with other bodies such as the Institution of Civil Engineers, not inquire into the means by which candidates obtain their knowledge of ancillary subjects, so long as they can show proof of that knowledge, together with its practical application, which would be vouched for by the person under whom they received their training, and who, presumably, would be a member of the Institution. In the meantime it is well to bear in mind

* "Gas Journal," Vol. 181, p. 192.

† "Gas Journal," Vol. 181, p. 274.

* "Gas Journal," Vol. 180, p. 529.

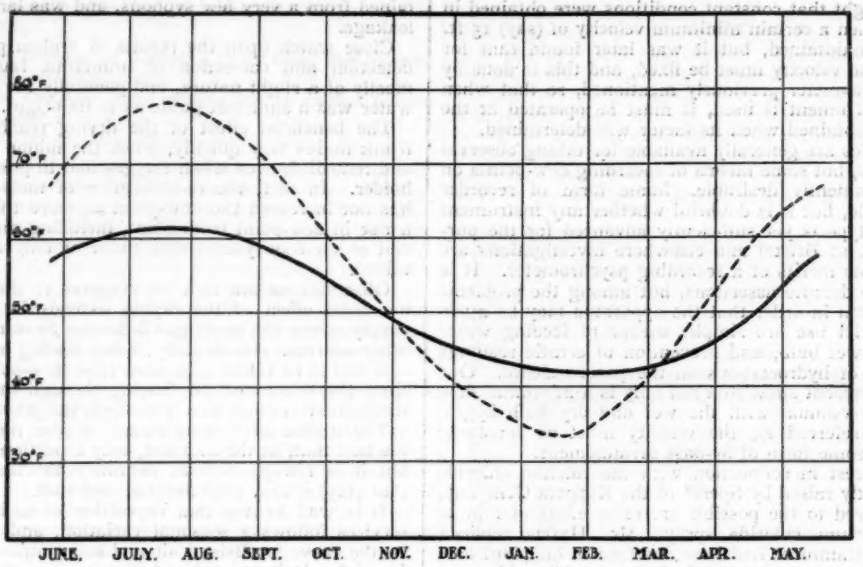


FIG. 5.

that certain requisite and necessary ancillary subjects such as mechanics, physics, and chemistry, can only be adequately studied when laboratory work is taken in conjunction with lectures; and such laboratory work cannot be carried out through the post. Therefore I feel that correspondence courses should only be sanctioned in those subjects when the District Committee is satisfied that nothing else is available.

The consideration of how and where the requisite training may be obtained naturally leads to consideration of another recent event which is of great interest to juniors—namely, the formation of Education Sub-Committees in various districts. One of these Sub-Committees has been set up in our own area, and it is advisable for all to be aware of its purpose and scope. In addition to the work of prevision, and arranging for the future, the Committee is intended to deal particularly with the difficulties of such students as are not provided for in the ordinary way by local Education Authorities, so that facilities may be arranged for them. This work should have great value in a large scattered area such as ours. The education of those men who do not come, at the moment, within the scope of the major courses is of very great potential value to the industry as a whole, as well as to the men concerned, and I believe there is an impression in the minds of many that the Sub-Committees were designed to deal only with the major courses of the Education Scheme. This is not so, and, speaking at the moment for the West of England, a great amount of effort is being concentrated on the minor courses, because while it is felt that at no one time can a large number of students be expected from one area for the major courses, it is realized that there certainly exists a large demand for educational facilities in the minor ones. There are great hopes of inaugurating a number of centres, such as Bristol, Bath, Weston-super-Mare, Taunton, Exeter, and Torquay, where recognized courses in gasfitting will be provided; and possibly many of the students who pass through them will eventually go forward to the Institution's major courses, because much can be done to guide men whose positions do not allow of college or university training, but who nevertheless possess that latent energy which, given the necessary training and opportunity, would bring them into responsible positions. They must, however, realize that for success a thorough grounding in general knowledge must precede specialization.

I should like to elaborate these observations with particular reference to Bristol, where the Education Scheme is in operation at the Merchant Venturers' Technical College. The courses there follow the lines of the schemes set out by the Institutions of Mechanical and Electrical Engineers and the Institute of Chemistry, for the award of National Certificates in the respective subjects. Three-year courses are provided in both engineering and supply. In the case of gas engineering two parallel courses are available—one for students who wish to specialize on the chemical side, and the other for those who incline towards the mechanical engineering side. In gas supply, the Board of Education, in conjunction with the Institution, now requires this subject to be introduced in the second year of the course; and the change has been recently made in the College arrangements. Unlike other industries which have National Certificate schemes in operation, certain well-known obstacles are encountered in the gas industry which make the successful working of the scheme very difficult. It is rarely that one finds more than a single gas undertaking in any large industrial centre, whereas several mechanical, electrical, and chemical concerns may exist. The number of students entering upon certificate courses is therefore limited, and there may not be a constant supply of new students in sufficient numbers to warrant the continuance of the whole three-year course. This paucity of numbers also makes it difficult for classes to be arranged specially for the gas industry, so that at present, in Bristol, our students must take their cognate subjects with mechanical engineering or chemistry students. It is felt that it would be preferable to have special classes in all subjects for the gas industry only. The scheme, however, as at present administered in Bristol, is infinitely better than no scheme at all, and the College Authorities take every opportunity of adjusting the courses to changing conditions in order to maintain the highest efficiency—in fact, I have been informed* that classes for gas students only will be arranged as soon as the number of entries warrants such a procedure. The arrangement of the courses in Bristol is as follows:

CERTIFICATES IN GAS ENGINEERING AND GAS SUPPLY.

The courses prepare for the Examination of the Institution of Gas Engineers for the award of Ordinary Certificates in Gas Engineering and Gas Supply. The full course occupies three years in each case.

A. GAS ENGINEERING—CHEMISTRY.

Course No. 33.—*1st Year Gas Engineering (A)*:

Practical Mathematics, 3rd year	Monday, 7.10–9.15.
Physics, Elementary (with Lab.)	Thursday, 7.0–9.50.
Chemistry, Inorganic, Elementary (with Lab.)	Wednesday, 7.0–9.50.

Course No. 34.—*2nd Year Gas Engineering (A)*:

Practical Mathematics, 4th year	Wednesday, 7.10–9.15.
Physics, Matriculation (with Lab.)	Monday, 7.0–9.50.
Chemistry, Inorganic, Matriculation (with Lab.)	Friday, 7.0–9.50.

Course No. 35.—*3rd Year Gas Engineering (A)*:

Chemistry, Inorganic, Intermediate (with Lab.)	Tuesday, 7.0–9.50.
Chemistry, Organic I. (with Lab.)	Thursday, 7.0–9.50.
Gas Engineering	Monday, 7.10–9.15.

B. GAS ENGINEERING—ENGINEERING.

Course No. 36.—*1st Year Gas Engineering (B)*:

Practical Mathematics, 3rd year	Monday, 7.10–9.15.
Engineering Drawing, 3rd year	Tuesday or Thursday, 7.10–9.30.
Engineering Science, 3rd year	Tuesday or Thursday, 7.10–9.30.

Course No. 37.—*2nd Year Gas Engineering (B)*:

Practical Mathematics, 4th year	Tuesday or Wednesday, 7.10–9.15.
Engineering Drawing, 4th year	Monday or Friday, 7.10–9 30.
Engineering Science, 4th year	Wednesday or Friday, 7.10–9.30.

Course No. 38.—*3rd Year Gas Engineering (B)*:

Applied Mechanics I.	Tuesday, 7.0–9.30.
Heat Engines I.	Thursday, 7.10–9.30.
Gas Engineering	Monday, 7.10–9.15.

* By Mr. W. A. Andrews, B.Sc., A.I.C., Superintendent of the College Classes.

C. Gas Supply.

Course No. 36A.—*1st Year Gas Supply*:

Practical Mathematics, 3rd year	Monday, 7.10–9.15.
Engineering Drawing, 3rd year	Tuesday or Thursday, 7.10–9.30.
Engineering Science, 3rd year	Tuesday or Thursday, 7.10–9.30.

Course No. 37A.—*2nd Year Gas Supply*.

Practical Mathematics, 4th year	Tuesday or Wednesday, 7.10–9.15.
Gas Supply I.	Monday or Friday, 7.10–9.15.
Engineering Science, 4th year	Wednesday or Friday, 7.10–9.30.

Course No. 39.—*3rd Year Gas Supply*

Building Construction I.B.	Thursday, 7.30–9.30.
Applied Mechanics I.	Tuesday, 7.0–9.30.
Gas Supply II.	Monday, 7.10–9.15.

Fee for 1st year courses	7s. 6d. per session.
For remaining courses	10s. 0d. per session.

The duration of the session is twenty-five weeks, and in order to qualify for the certificate examination students must make at least 60 p.ct. of the possible attendances in each year, and pass the sessional examinations.

The Gloucestershire Education Committee pays the travelling expenses of students at the College, resident in the Administrative County of Gloucestershire, where application is made and approved by the Committee.

A perusal of these particulars brings to mind another important point. Having had occasion to discuss courses of study with numbers of prospective students, I find they are apt often to magnify the difficulties to be faced, in spite of the fact, as many of us know, that facilities are better to-day than ever they were. Students attending classes in Bristol cannot complain on financial grounds, because it will be seen that they obtain tuition, with excellent laboratory facilities, for just over a halfpenny per hour. It is not so widely known as it should be that this is due to the public-spirited attitude of the Society of Merchant Venturers, who bear about 80 p.ct. of the cost incurred by each student at the College. Hence the low cost to the student. It is incumbent upon those in positions of authority to see that the feet of all juniors are set upon the right educational road at the outset, and to be sure that the courses of study embarked upon are the right ones having regard to individual requirements, so that valuable years may not be wasted. In Bristol it is our practice, some time before the commencement of the session, for heads of departments to find out how many prospective candidates they have; and these are then interviewed individually. I make no apology for referring to this matter at such length because it is only natural that the leaders of the future must be drawn from the Juniors of to-day, and, to many, the truism that there is plenty of room at the top is not realized until they are faced with a big position which might have been successfully tackled if they had only trained for it.

Co-operation of the Chemist and Other Departments.

Having had considerable experience of both the laboratory and the works, perhaps I may be permitted a few observations on the position of the chemist. From beginning to end the manufacture of gas is essentially a chemical industry, while the efficient distribution and use of it can only be attained by a sound knowledge and application of physico-chemical principles. There is, therefore, ample scope for the chemist in our industry, and his co-operation with other departments is bound to lead to increased efficiency. The training of a chemist occupies a number of years, and, at the end of that time, his knowledge of fundamental principles should enable him to contribute much to the solution of the many problems which are always with us. After leaving the university, however, it is necessary for him to cultivate an industrial sense of values, to modify the laboratory sense of time, and to realize that no concern, whatever its size, is intended to be run on philanthropic lines, because, though the industry exists to supply a great public need, it is also expected to pay its way. In my opinion, the technical assistant often stops short in his investigations, with the result that his work is reduced in value. For instance, if called upon to investigate some trouble, he should not merely carry out analyses or tests, submit the figures to his chief, and leave the matter there. He should always make deductions from his results, and be prepared with suggestions for a solution of the difficulty. There are, of course, times when his opinion may not be asked, but even then the mental process should be carried out in preparation for the future. Apart from control of the quality of materials and the efficiency of processes, it is essential that the chemist should be able to co-operate with the outside departments, particularly when complaints are received from large consumers. A knowledge of the composition and behaviour of gas under different conditions is vital in such cases, and may result in retaining the goodwill of that great asset, the satisfied consumer.

The chemist should always be on the look-out for means of preventing waste and increasing efficiency. He should cultivate the altruistic spirit, because modern problems are such that team work is essential for their satisfactory solution.

Organization of his department, standardization of methods, correct record work, and helpful co-operation with other members of the technical staff will do much to place the chemist in the important position he is bound eventually to occupy in the industry.

Conclusion.

As Juniors we should be in possession of the three things which have been stated as necessary in business—knowledge, temper, and time. That being so, there is no lack of problems to absorb our energies, whatever our particular sphere of activity; but in order to keep pace with present-day possibilities, it is absolutely necessary to follow current literature and to keep a mental waste paper basket, as recommended by Samuel Butler. In the case of many problems, the necessary preliminary research work may have to be done by those who are able to concentrate their whole attention upon the particular work, and carry it out in places specially equipped, but there always comes a stage when the knowledge so obtained can be applied to everyday conditions; and this marks our opportunity. On the works side, for example, carbonizing plant and methods are constantly being modified; and even assuming "that profits are made in the retort-house," there are ample chances of losing them outside. For instance, the process of dry purification is still very empirical, as evidenced by the number of formulæ for size and capacity of boxes, and much expense can be incurred by the unnecessary changing of purifiers. Then there is the question of wet purification, a method which I think will undoubtedly come into extensive use when the trouble of cheaply removing those impurities which exert a very low partial pressure has been overcome. For the distribution man there is excellent scope for almost unlimited work on corrosion and electrolysis. These observations are intended to act as a stimulus to continual effort, because then ultimate success is certain. Finally, let us remember the words of Emerson: "The reward of a thing well done is to have done it."

Mr. Armitage, proposing a vote of thanks to the President, said they had expected an address of a high order, and had not been disappointed. The address bristled with interesting points, and provided them all with much food for thought.

Mr. Spencer (Junior Vice-President) seconded the vote, which was carried with acclamation.

Visit to Ideal Home Exhibition at Bristol.

The meeting concluded with a visit to the Ideal Home Exhibition, being held at the Colston Hall, where the Bristol Gas Company had an excellent display. The various details were explained by Mr. Conway and his assistants.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Teachers' Course.

Sir,—May I draw special attention to the Course for Teachers of Gas Engineering and Gas Supply which the Board of Education have arranged at Westminster Training College and Westminster Technical Institute from July 23 to 27? Intending teachers of these subjects and teachers of ancillary subjects are also eligible for admission. The Board pay 3rd Class return railway fare, and accommodation is provided at the Westminster Training College for £2 10s. for the week.

I understand that the number of applications is smaller than was anticipated; and as these classes are not held in approved schools every year, it is possible that some who would have applied are unaware of the proposed Course. Though the period within which applications should have been made has expired, favourable consideration will be given to further applications, which should be made on forms to be obtained from the Secretary, Board of Education, Whitehall, S.W. 1.

I hope that gas undertakings in whose service any teachers or intending teachers may be engaged will give facilities to them for attending this exceedingly useful Course. If our Education Scheme is to be fully successful, the right teachers must be available; and it has to be remembered that to possess knowledge is one thing—to know how to impart it quite another. The Course is designed to help teachers to acquire the art of teaching.

F. W. Goodenough,
Chairman of Education Committee,
The Institution of Gas Engineers.

Gas Light and Coke Company,
Horseferry Road,
Westminster, S.W.,
April 18, 1928.

Results at Richmond (Yorks.)—The accounts for the half-year ended March 31 of the Richmond (Yorks.) Council's gas undertaking show that, after providing for debt redemption, there is a balance on the revenue account of £1484. The Council agreed to give £500 to the Borough Fund in aid of the rates, to charge to revenue a sum of £384 balance overspent on capital account, and to carry forward the balance of £600.

REGISTER OF PATENTS.

Multiple Jet Gas Burners.—No. 287,291.

KIRKE, P. ST. G., of Victoria Street, S.W. 1.

No. 4129; Feb. 14, 1927.

It is recognized that in a gas-fired boiler the jets should be separately adjustable and collectively controllable; and while a burner fulfilling this desideratum is satisfactory in the case of clean gases, the restriction of each jet gives trouble when gas containing tar and other matter, such as producer gas, or dust, such as blast furnace gas, is used. These impurities are apt to clog the restrictions, and the jets require cleaning.

The present invention enables each jet to be made of the maximum desirable bore and avoids the necessity for adjusting each jet separately, by arranging that the maximum velocity of gas flow occurs at a restriction situated between the gas control valve and the jets.

In the preferred form of burner the known construction of a header carrying a number of branch pipes, each of which carries the jets corresponding with a row of boiler tubes, is adopted (in a boiler of large size there may be more than one such burner); and the restriction is conveniently a perforation in a diaphragm contained in the supply pipe between the controlling gas cock and the header carrying the branch pipes. Instead of a single restriction for all the jets there may be a restriction at the entrance to each branch pipe carrying a number of jets.

Valves.—No. 287,368.

POWER-GAS CORPORATION LTD., and RAMBUSH, N.E., both of Stockton-on-Tees, and HARPER, C. S. D., of Nunthorpe.

No. 17,162; June 28, 1927.

This invention relates to gas valves of the double-faced gate or sluice type (such as are employed especially in water-gas practice), and aims at greater certainty of tightness against leakage and greater capacity to withstand the known severe conditions of working.

To this end, the valve discs are each provided on their backs with co-acting helical surfaces situated in the vicinity of the periphery of the discs substantially in line with the respective valve seatings; the helical surfaces bearing directly one upon the other and being adapted, on rotation of the discs, mutually to enforce their peripheral portions into close contact with the valve seats. By virtue of this construction the pressure forcing the valve discs against their seatings is applied peripherally and in line with the seatings, and not centrally as usual, with the result that the liability of leakage is substantially reduced. In order to effect the closure, a slight rotary motion in opposite directions is imparted to the valve discs when opposite their seatings, by means of links connected to the valve spindle in known manner and extending obliquely on opposite sides thereof to the valve discs. A further claim is for a relief valve which is opened automatically as the main valve closes.

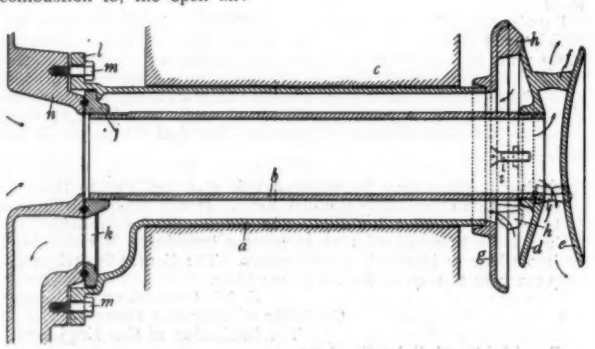
The invention is described in detail with drawings.

Inlet and Outlet Vents for Gas Appliances. No. 287,335.

DAVIS, H. N., and TWIGG, W. R., both of Luton, and RADIATION, LTD., of Aston.

No. 10,304; April 14, 1927.

This invention relates to gas radiators, cookers, boilers, geysers, and other like apparatus, and more particularly of the kind in which the flame is enclosed or separated from the atmosphere of the apartment. The object of the invention is to provide improved means for conducting air to the burner from, and expelling the products of combustion to, the open air.



Vent Pipe System for Gas Apparatus.—Davis and Twigg.

We reproduce a section of the pipe arrangement which forms the subject of the invention.

A pair of short inlet and outlet pipes *a*, *b* respectively, are arranged concentrically one within the other and adapted to be inserted through the wall *c* of an apartment. A sufficient annular space is left between the pipes to afford a free passage of the required cross section. To the outer end of the inner pipe *b* is attached, by a screw connection or otherwise, a flange *d* of truncated conical form; and at a suitable distance in front of this flange is secured another flange *e* of concavo-convex or other suitable form, the central portion constituting a solid disc which is situated opposite the open end of the inner pipe. By means of the flanges an annular passage is provided between them to the open air, the cross-section of the passage gradually increasing from the centre towards the periphery. The two flanges are connected by a number (conveniently three) of narrow intermediate transverse pieces *f* formed integrally with, or otherwise permanently secured to, the flanges.

At the outer end of the outer pipe *a* there is provided a flange *g* of dished formation, the peripheral portion of which overhangs towards the inner flange on the inner pipe; an annular passage leading to the open air being provided between the peripheral portions of the said flanges. Preferably the flange on the outer tube has formed on it a number of narrow seating strips *h* with which the inner flange on the inner tube can co-operate. These seating strips serve to locate the flanges on the two tubes in the proper relationship. The flanges on the two tubes may be secured together by screws *i*.

At the inner end of the two tubes is secured a box-like fitting by which independent communication can be established with the inner ends of the passages in the two tubes. In one construction, the inner tube is screwed into a boss *j* formed in a plate *k*, and the outer tube is suitably shaped to accommodate the said plate. Also the outer tube is formed with a flange *l* by which connection can be effected through the medium of screws *m* with the rear of the apparatus *n* for which the inlet and outlet pipes *a*, *b* are required.

Distillation of Carbonaceous Materials.—No. 287,381.

NIELSEN, H., of Muswell Hill, and LAING, B., of Victoria Street, S.W. 1.

No. 19,619; Dec. 4, 1926. No. 4842; Feb. 21, 1927. No. 13,410; May 18, 1927.

This invention relates to the distillation, with bye-product recovery, of solid carbonaceous materials, such as coal, lignite, brown coal, peat, wood, shale, and the like.

The patentees point out that in order to distil carbonaceous materials for the purpose of oil recovery the amount of heat needed per unit of weight to effect the necessary thermal changes is well known and varies from 200 to 300 kg. cal. per kg. of dry coal. If, however, this figure is resolved, it becomes apparent that the amount of heat required to penetrate in a given time from the periphery to the centre of each particle of coal or through any thickness of fuel bed so as to effect the necessary thermal changes actually depends upon the following main factors: (1) The mean temperature difference which exists at any stage in the heating process between the heating medium and the material undergoing treatment; (2) the total superficial area of material exposed to the action of the heating gases; (3) a co-efficient of heat transference or transmission which includes a time factor; and (4) the distance through which the heat has to penetrate. Consequently, the total thermal work effected is a function of these four factors. Since, however, the oil vapours are very susceptible to temperatures higher than those at which they are liberated from the carbonaceous material, it is necessary, if cracking or decomposition of the vapours is to be reduced or practically eliminated, that the vapours, after being liberated at the particular temperature at which they are evolved, should not pass into zones which are at higher temperatures or be brought into contact with highly heated surfaces, as, if cracking occurs to any extent, the yield of oils is reduced, while the heavy oils which result from the process are unsuitable for lubricating purposes. In order to reduce or eliminate cracking it has been found necessary to modify one or more of the four aforesaid factors; but this must be carried on in such a way that the total thermal work effected remains the same.

According to one feature of the invention the process of distilling solid carbonaceous materials is carried on in such a manner that for any suitable size of particle or piece of carbonaceous material or for suitable thickness of fuel bed the period or time factor of distillation is so controlled that at any stage in the distillation process a temperature difference exceeding 120° to 150° C., but preferably of the order of 100° to 120° C., is not allowed to exist between the temperatures prevailing at the centre and at the periphery of any given size of particle or piece, or any given thickness of fuel bed.

According to a further feature of the invention, the temperature zones throughout the length of the retort are graduated or controlled so that the oils are distilled off at the temperatures at which they volatilize and are then withdrawn from the apparatus in uniflow with the heating medium either at one end or at different points along the length thereof, and at temperatures at which no excessive cracking can occur, while the volume of inert gas whose sensible heat is employed as the distilling medium is so controlled as to lower the vapour pressure of the volatilizable oils as much as possible.

As a detailed description of one method of carrying on the process and involving all the features as described in the specification, the following example is given: A bituminous coal was distilled by means of a controlled volume of an inert gaseous heating medium (superheated water gas) which was brought into direct contact with the coal in a rotary retort; the raw coal, after preheating to a temperature of about 150° C., having a volatile content of 30 p.ct. The volume of water gas used was of the order of 55,000 c.ft., and entered the retort at a temperature of 750° C. and a pressure of ½ in. W.G. It was observed that oil began to distil off at 210° C. together with a small volume of gas; and at or about 550° C. all the oil-giving or condensable hydrocarbons were removed.

The products obtained per ton of raw materials at this temperature (550° C.) were: 20 gallons of oil; 15 gallons of ammoniacal liquor; and 2500 c.ft. of stripped retort gas combined with water gas. The volatile matter still present in the solid material was reduced to 10 p.ct.

Microscopic research showed that practically no deposit of graphitic

carbon was present. It was also found that, owing to the fact that cracking did not take place owing to exact temperature regulation, to the fact that the oil-yielding constituents were carried off in uniflow with the heating gases, and to the fact that the volume of heating gas employed was controlled, a primary oil was obtained containing a large percentage of the more valuable high-boiling fractions or lubricating oils rich in hydrogen.

The neutral oil obtained after removal of the acidic and basis constituents was considerably richer in hydrogen than that obtained by other methods of coal distillation. A large yield of lubricating bases of a specific gravity approaching that of water was also obtained from which a lubricating oil was extracted by the treatment hereinafter described which was of a character and quality hitherto unobtainable by any previous method of coal distillation. The neutral oil produced had the following characteristic properties: Hydrogen, by weight, 9·5 to 11·5 p.ct. Heavy lubricating bases having a hydrogen percentage above 9 p.ct. by weight and a specific gravity ranging from 0·95 up to 1·080, at 15° C. The total yield, after fractional distillation and refining, of oils having properties similar to the following derivatives from well oils and adapted for similar purposes was as follows:

	B.P.		P.Ct.
Petroleum ether	70°– 90°	..	3·0
,, naphtha	90°–120°	..	3·0
,, benzene	120°–150°	..	6·0
Kerosene	150°–300°	..	40·0
Lubricating oils	300°–420°	..	30·0
	M.P.		
Paraffin wax	45°– 65°	..	4·0

In order to produce a high-grade lubricating oil, that portion of the distillate boiling over 300° C. was then subjected to further treatment. To this end the tar acids were removed by caustic soda, and the resultant oil refined with sulphuric acid. The refined oil was then distilled, and the first 25 p.ct. was in this instance added to the so-called kerosene fraction. The remainder was then passed through a filter press at about −5° C. and the paraffin wax extracted. The wax-free oil after distillation gave lubricating oils of a rather dark red colour and a marked green fluorescence. The yield of all grades of lubricants by the aforesaid treatment amounted to about 15 p.ct. of the total original crude oil. The amount of lubricating oil equivalent to so-called spindle oil was of the order of 5 p.ct. of the original crude oil. On testing the lubricating oil so obtained, it was found that at normal temperatures—12° to 18° C.—it had a so-called static coefficient of friction of from 0·1 up to 0·185.

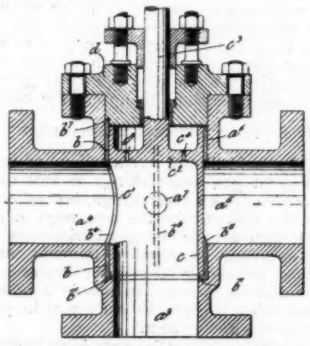
The residual solid fuel discharged from the retort contained about 10 p.ct. volatile matter and was exceedingly reactive and easily oxidized, either by free oxygen or the combined oxygen present in metallic ores, such as iron or copper oxides and the like, or in steam. Consequently the solid carbonaceous residue resulting from the present process is claimed to be of greater value for domestic use or industrial processes than the material hitherto produced by low-temperature distillation. As the carbonaceous residue from certain coals, particularly those of a non-coking variety, may be produced in a friable state, it is eminently suitable for use, after crushing, as powdered fuel, owing to its high degree of reactivity and free-burning properties.

Valves.—No. 287,432.

HUMPHREYS & GLASGOW, LTD., and FARTHING, G. G., both of Victoria Street, S.W. 1.

No. 32,126; Nov. 29, 1927.

This invention refers to a simple construction of directing valve having two or more discharge ways or ports which, even when of large size, can be easily operated and will yet substantially prevent leakage past it to one passage-way when it is set to direct the flow of fluid to another. The valve is primarily intended for use as a steam valve in water gas apparatus where, with the comparatively low pressures now frequently employed, the steam pipes are of large internal diameter. It will be seen in the central vertical section that the valve casing is formed with a supply branch a^3 and delivery branches a^4 and a^5. Opposite the branch a^3 is another branch a^6, and this branch and the inner part of the branch a^3 are enlarged to receive a liner b formed with ports b^4 and b^5 corresponding to the branches a^4 and a^5 and with an internal flange b^1 which beds on a shoulder in the branch a^3. Within the liner and resting on the



Steam Valve for Water Gas Plant.—Humphreys & Glasgow.

flange b^1 is fitted the tubular valve c. The valve is open at its lower end, has a single port c^1, which by turning the valve can be brought into register with either port b^4 or b^5, and near its upper end has a diaphragm c^2 which is formed with one or more perforations c^4 and from which extends the spindle c^3. The liner b and the valve c are retained in position by a cover d formed with a stuffing box through which the spindle extends. The liner is prevented from turning by a lug b^7 engaging a recess in the cover d. The valve is lubricated by oil from a lubricator (not shown) attached to the boss a^7 on the valve casing, and passing through holes therein and in the liner to a groove b^6 in the inner face of the latter.

The valve c, which is cylindrical, being partially balanced by the pressure on opposite sides of its diaphragm c^2, and being only a reasonable fit in the liner b, can be easily turned, and will tend, owing to the single port c^1 unbalancing it laterally, to seat itself over the closed port b^4 or b^5.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 12.]

Nos. 9822—10,448.

BINGHAM, J. H.—"Diaphragms of gas meters." No. 9904.
BISSELL, W.—"Gas fires." No. 9958.
KEMPTON, C. H.—See Bissell, W. No. 9958.
PARKER, J.—"Dehydration of coal gas." No. 10,276.
PARKINSON & COWAN (GAS METERS), LTD.—"Prepayment mechanism." No. 10,224.
SMITH, W. P.—"Gas oven cookers." No. 10,255.
THORPE, F.—See Parkinson & Cowan (Gas Meters), Ltd. No. 10,224.
TULLY, A. V.—"Apparatus for manufacture of water gas." No. 10,166.
TULLY, SONS, & Co., LTD.—See Tully, A. V. No. 10,166.
VERNON, J. W.—"Treatment of gaseous matter containing sulphuretted hydrogen." No. 10,477.

[Extracted from the "Official Journal" for April 18.]

Nos. 10,449—11,136.

ALLENDER, J. J.—"Gas heating stoves." No. 10,669.
BARRETT CO.—"Distillation of tar and recovery of products therefrom." No. 10,557.
BARRETT CO.—"Production of pitch." No. 10,795.
BRAUNE, A.—"Gas cookers." No. 10,599.
CALLANDER, M.—See Allender, J. J. No 10,669
CHANDLER, D.—"Gas burners." No. 10,747.
CHEW, J. H.—"Gas burners." No. 10,602.
CLAPHAM, T. A.—"Apparatus for washing, &c., gas." No. 10,450.
COOKE, J. J.—See Chandler, D. No. 10,747.
DEMPSTER, LTD., R. & J.—"Weighting means for gasholders." No. 11,078.
DEMPSTER, LTD., R. & J.—"Base, &c., portions of gasholders." No. 11,079.
HARBORD, V.—"Retort furnaces for carbonization." No. 10,938.
HATTERSLEY & DAVIDSON, LTD.—"Gas service cleansers." No. 10,896.
HEUSSLER, J.—See Braune, A. No. 10,599.
HOBSON, H. A.—See Chew, J. H. No. 10,602.
HUBBARD, W. S.—See Dempster, Ltd., R. & J. No. 11,079.
HUMPHREYS & GLASGOW, LTD.—"Gas generators." No. 10,700.
IMPERIAL CHEMICAL INDUSTRIES, LTD.—"Production of pure ammonium sulphate." No. 10,666.
KNIGHT, H. S.—See Dempster, Ltd., R. & J. Nos. 11,078, 11,079.
MAIN, LTD, R. & A.—"Gas cocks." No. 10,819.
MASCHINENFABRIK AUGSBURG-NURNBERG AKT.-GES.—"Gasholders." No. 10,996.
PARKINSON & COWAN (GAS METERS), LTD.—See Chew, J. H. No. 10,602.
PATON, J. D.—"Carbonization plant." No. 10,603.
PICKFORD, W. E.—See Hattersley & Davidson, Ltd. No. 10,896.
POWER GAS CORPORATION, LTD., and RAMBUSH, N. E.—"Charging furnaces with solid material." No. 10,906.
ROBINSON, H. N.—See Main, Ltd., R. & A. No. 10,819.
SLADE, R. E.—See Imperial Chemical Industries, Ltd. No. 10,666.
SMITH, W. G. L.—See Hattersley & Davidson, Ltd. No. 10,896.
SOUTH METROPOLITAN GAS COMPANY.—See Chandler, D. No. 10,747.
TILL, W. C.—"Gas stoves." No. 11,020.
WAGNER, R.—"Gasholders." No. 10,991.
WATERLESS GASHOLDER CO., LTD.—See Dempster, Ltd., R. & J. No. 11,078.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Barnet District Gas and Water Bill: Read the third time, with the amendments, and passed; returned to the Commons.

Llandudno Urban District Council Bill: Brought from the Commons; read the first time; and referred to the Examiners.

Birmingham and Cockermouth Gas Orders: Referred to the Special Orders Committee.

HOUSE OF COMMONS.

Progress of Bills.

London County Council (General Powers), and Middlesex and Surrey (Thames Bridges, &c.) Bills: As amended, considered; read the third time, and passed.

Birmingham Gas Order: Copy presented.

MISCELLANEOUS NEWS.

PRIMITIVA GAS COMPANY OF BUENOS AIRES, LTD.

ANNUAL GENERAL MEETING.

The Twenty-Seventh Annual Ordinary General Meeting of the Company was held on Wednesday, April 18, at Winchester House, Old Broad Street, E.C. 2—Mr. P. A. COOPER (Chairman) presiding.

The SECRETARY (Mr. Robert Grant) read the notice convening the meeting and the report of the Auditors; and the report of the Directors and the statement of accounts for the year ended Dec. 31, 1927, were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said: Before dealing with the accounts, I must tell you how pleased the Board are to welcome to our Local Committee Dr. Ramon Mendez, a most distinguished lawyer, and till recently President of the Supreme Court of the Nation. With our Chairman, Sir Manuel Montes de Oca, and Dr. Ramon Mendez we are satisfied that our affairs are in the best hands it is possible to find. As there are several important alterations in the accounts before you, I will explain in some detail the principal changes.

INCREASED PROFITS.

In the revenue account, owing to revised methods of accounting, the figures are not comparable with last year's figures. But broadly I may say that our revenue from gas and chemicals has risen, while that from residuals has fallen slightly, due to lower prices for coke and breeze. Expenses in some cases are higher, due to our ever-increasing activity and our desire to improve our service. As I have explained before, increased or better staff and training and development are expenses which do not bring immediate profit, but which in the future will give you a handsome return. The balance carried from this account is £214,000—an increase of £54,000.

In the profit and loss account, the sinking fund allocation is £13,100—a useful reduction in our liabilities. London Office expenses appear to be down. In fact, they are up, owing to our increased activity, but a larger amount is charged to Buenos Aires on account of more stores and shipping. The balance carried to the balance-sheet is £151,000—or nearly four times the net profit of three years ago—from this and the balance brought forward the Board have placed £74,000 to contingencies account, and £76,000 to depreciation account, leaving £12,000 odd to be carried forward.

On the balance-sheet, share capital has increased as stated in the report. Debentures and debenture stock, in spite of redemption, have risen by £80,000. This is one of the legacies we have inherited, but we have not hesitated to write off the whole of the discount at once. Since the closing of the accounts we have redeemed a further £42,000 (nominal) of debentures and debenture stocks. You may remember that a short time ago the debenture holders agreed to the expropriation of certain property—part of that sold to the Electric Company in 1903 and being paid for by instalments. The proceeds will be used to redeem first debentures, and this will accelerate their redemption. Loans, bills payable, creditors, at £280,000, are £94,000 down, in spite of our considerably increased business.

Regarding the reserve accounts, the first item, lands, buildings, &c., incorporates items which previously appeared in other accounts. The sum of £78,000 has been spent on new plant, &c., during the year. South Barracas is up by £19,000; and as this is now our property, you may consider this as a further sum spent in the development of your own business. Stocks are down by £43,000; but this is largely due to adjustments and to £15,000 of obsolete stock which we found in the reorganization of the stores department, and wrote off. "Investment" is our own debenture stock at cost, and includes a reserve of £16,000.

Getting back to the various reserves, with the allocations now made these stand at the substantial figure of £554,000. Moreover, that is after writing off every bad or doubtful item we have found, and charging off expenses which less conservative people might well have capitalized.

The reserve accounts are all clear, except perhaps the contingency account. You will remember that when we took over the management of this business I told you we should have some shocks; and so we made a "shock absorber." As we investigated the business, we found all sorts of items which should have been written off ten and fifteen years ago; and we have been put to great expense in reorganizing departments which should have been up to date. Well, we use this account for the purpose of dealing with these unforeseen or non-recurring contingencies. You can see for yourselves that we might have commenced paying dividends, but we believe that conserving your resources for development is the quickest way of getting you a satisfactory return. As stated in the report, we believe that from now on you will receive reasonable and improving dividends.

INCREASED SALES OF GAS.

Sales of gas have increased by 7½ p.ct., and the number of consumers by 9½ p.ct., while the gas unaccounted-for has decreased from 18·4 p.ct. to 17·2 p.ct. We have just received a cable from Buenos Aires showing that for the first three months of this year the rate of increase in gas sales and new consumers is even greater than those figures I have given you. The cable ends: "Demand for gas steadily increasing."

Now having dealt with the figures, I will tell you something of our past year's work. Like the two previous years, it has been one of intense activity. I cannot possibly do more than indicate a few of the main items on which our staffs have been at work. As you know, I was out again in Buenos Aires for a considerable time last year, working closely with our Local Committee and Management. I know this Company and its affairs pretty well now; and I can tell you that the condition of affairs as I saw them first and the steps necessary to put them right might well have proved too much for the Management. But our staffs have never hesitated; and while there is much to do, I know they feel they are getting over the worst of the clearing up, and getting on to real constructive work.

In the gas-works and in the chemical works our engineers have been hard at work putting down new plant, overhauling and rebuilding old plant, and improving methods of chemical control. A complete fire protection installation with a fire brigade has been formed. A systematic campaign for the prevention of accidents has been carried out, and the decrease in the number of accidents during the year is most gratifying. We are now planning to rebuild and re-equip the mechanical shops, and to build and equip a new laboratory. In the distribution department a new maintenance scheme is being inaugurated, and attention to customers improved. The standard of our gas-burning appliances is being steadily raised. We are planning to increase our industrial department, which was started last year and which has already attained a certain amount of success. A revised transport system is now being adopted. An expert from a well-known firm of meter makers is now in Buenos Aires, with a view to advising the Board on how best to bring our meter and stove repairing shops up to the highest standard of modern practice. The gas sales department is also in process of being further overhauled and developed, and we are gradually getting together and training a force of canvassers and salesmen. You will be glad to hear that recently the demand for cookers, geysers, &c., has been greatly increased. The reorganization of the accounts department—probably one of the most important and difficult steps we have taken—is now virtually finished. The stores and store systems have been completely overhauled and remodelled, as has the purchasing and shipping department. The cost of the whole of this reorganization and all obsolete stocks have been written off. The Province of Buenos Aires Gas Company has been formed, and is now being reorganized on the lines I have just described. I know that district well; and I look forward to seeing this little Company grow into a most satisfactory undertaking.

TRAINING OF STAFF.

Last year I explained to you the difficulty we have in getting the right men, and the steps we were taking to train them. Our plans are being carefully developed, and as we can we will extend them. In the meantime our standard of work is gradually improving. We regard this training of staff as most important. Our aim is to raise the standard right throughout the whole organization. We are determined to give the high-class service which the progressive and cultured community of Buenos Aires deserves.

Now it only takes me a few moments to report to you all this work which is going on; but if you consider carefully, you will appreciate the great task the reorganization is imposing on the staff. Shareholders and others have been very kind in the remarks they have made regarding the progress of the Company, and have attributed it to the Board; but I want to say this: While we may have pointed the direction and set the pace, it is our staffs who have picked up the burden and carried it. You and we have every reason to thank them.

Following my visit to Buenos Aires we sent out an experienced Consulting Gas Engineer to study the whole of our plant and districts, and with the General Manager to draw up plans for the future. He and the General Manager returned together to London, bringing with them a plan of development for several years ahead. This plan, which will gradually be developed in detail, will naturally entail considerable capital expenditure, but we anticipate no difficulty in obtaining all the capital required over the next few years. We are asking you to increase the capital to-day to £3,000,000. We are not intending to make any issue immediately, but you will, I am sure, agree that with our rapid progress it is important for the Company to have the extra capital powers available when required. We are financing our extensions very comfortably, but, with our business developing as it is, the contingency may arise at any moment. We are considering the total redemption of our first debentures, which would release £32,500 per annum for the general purposes of the Company. But we have come to no definite conclusion yet.

HELP FROM OTHER UNDERTAKINGS.

This year again I should like to pay a tribute to the very generous way in which the great gas undertakings in this country are helping us—and not only the gas undertakings, but other businesses too. We are always on the look-out for the best ways of carrying on our work, and we find them outside the gas business as well as in it.

Shareholders have asked us whether there is any truth in the rumours that we are proposing to sell our business to the Electric Light Company in Buenos Aires. As this is a matter of first importance to you, we think it right to place you in possession of the whole of the facts as we know them.

Some time before the present Directors joined the Board, conversations took place between representatives of the Electric Light Company (which you gentlemen know as the German Overseas Electricity Company, now the "C.H.A.D.E.," particulars of which were recently published in London) and the old Board of this Company. As a result of these conversations a memorandum setting out the basis for a sale was submitted to this Company. I was in Buenos Aires

at the time; and though I had been a Director of the Company a few days only, I had already learned enough to see the potentialities and to advise my colleagues that the offer should not be accepted. Indirect approaches took place at different times, and a year later another proposal for sale was made which we found unacceptable. During the following year—that is, last year—we were twice approached from the United States of America asking us to sell the business, which again we declined to do. We have also been approached by another Group. In Buenos Aires last summer, and again in London, I met a representative of the "C.H.A.D.E.," who proposed that our Companies should co-operate. On behalf of your Board I at once agreed in principle to such a suggestion. It is obvious that two Corporations such as ours dealing in two commodities both essential to modern city life can co-operate to the benefit of themselves and the city they serve. But unfortunately we found that the "C.H.A.D.E." idea of co-operation was like the Young Lady of Riga and the Tiger. We were to be the young lady inside the tiger. In other words, our business was to be taken over and managed for us. We are willing to co-operate where we can see mutual advantage, but the Board are convinced that this Company has a great future; and we are satisfied that our organization is capable of bringing about that successful future. We want to keep this Company British, too—for the sake of British trade and British prestige. I calculate that by the orders we place in this country we are at the moment giving whole-time employment to more than 1500 men in England; and the figure is rising every year. This may surprise you. It is a subject which deserves more thought than it gets from our leaders in both politics and commerce.

Now this, gentlemen, is the whole story so far as we are concerned. The first offer we saw would have made your shares worth a few shillings; and the subsequent ones were better. But when you consider the balance-sheet as you see it to-day, and compare it with so recent a one as the first we presented to you two years ago, when you consider that the work we have been doing for these two years in only clearing up the past and getting ready for expansion and development, when you think of our potentialities, I have no doubt what your verdict will be.

Col. H. LeRoy-Lewis, C.B., C.M.G., D.S.O., formally seconded the resolution.

The Chairman, in reply to questions put by shareholders, said the Board were not in a position to declare an interim dividend. The matter had been given earnest consideration, but it was thought that the declaration of a dividend would not have been in the shareholders' best interests. Shareholders could take heart, however, that during the Board's three years' of office, the capital value of the shares had appreciated 300 p.ct.

The resolution for the adoption of the report and accounts was then unanimously carried.

The Chairman then moved "that the Board be and they are hereby authorized to increase the capital of the Company to £3,000,000 by the creation of 660,356 new shares of £1 each. Such new shares may be divided into different classes or may be of one class all ranking *pari passu* and may be issued on such terms and conditions and with such preference priority as regards dividends or in the distribution of assets or as to voting or otherwise over other shares of any class whether then or already issued or not or with such stipulations deferring them to any other shares in regard to dividends or in the distribution of assets as the Board may from time to time determine."

The Rt. Hon. Viscount St. Davids seconded this resolution, which was carried *nem. con.*

The Chairman then asked that the appointment of Lord St. Davids as a Director of the Company be confirmed.

Col. LeRoy-Lewis seconded this.

The Chairman proposed the re-election of Col. LeRoy-Lewis as a Director; this motion being seconded by Mr. Frank H. Jones, M.Inst.C.E.

The Auditors (Messrs. G. A. Touche & Co.) were re-appointed; and the meeting closed with a vote of thanks to the Chairman, Directors, and Staff.

HONG KONG AND CHINA GAS COMPANY, LTD.

ANNUAL MEETING.

The Annual General Meeting of the Company was held at 148, Gresham House, Old Broad Street, E.C., on April 17—Mr. Robert H. Glen, F.C.A. (Chairman), presiding.

The Secretary (Mr. A. C. Pullen) read the notice convening the meeting and the Auditors' report.

The Chairman: Gentlemen, copies of the report and statement of accounts having been sent to all the shareholders, I will ask you to take them as read.

At our last meeting I referred to the troubles being experienced at Hong Kong, and mentioned that, in consequence of the unfortunate conditions existing in some parts of China, troops were either being stationed in the Colony or were passing through to the affected districts on the mainland. The state of general unrest continued more or less throughout last year, but I am glad to say that at this date matters have much improved, and we may reasonably expect to benefit considerably from revival in trade there.

The Company's sales of gas increased by 11¼ million c.ft. at Hong Kong and 7⅞ millions at Kowloon; the Kowloon sales deriving considerable benefit through temporary stationing there of part of the Shanghai Defence Force. We are hoping our business at both Works will now go well ahead, and that the very large expenditure of money made during the past few years will be justified. The number of street lamps lighted by gas at Dec. 31 was 2352—an increase of 51. We had anticipated a larger addition, but Government were short of funds. We consider our street lighting to be of a high standard, and improvements are constantly under consideration. We sold or supplied on loan during the year 1951 "Surbiton," "Elite," "Pyrol," and other lamps, &c., for private lighting. Cookers, grillers, geysers, &c., sold or fixed on loan totalled 1921.

On turning to the accounts, I am glad to point out that the additions to land works and plant account amount to £6792 only, as compared with £14,128 for the previous year. The expenditure is again mostly in respect of Kowloon.

In the revenue account, cost of coal was $231,037 as compared with $172,984—an increase of $58,053. The average cost per ton was rather less, but we made 40·8 million c.ft. more coal gas. I would point out that, in addition to this large increase in make, the extra cost of coal was more than made up by the $71,406 higher value of residuals. On the last occasion I referred to the strenuous efforts made over many years for economy in coal matters. Our experiments with Indian Desherghur coal have not yet been quite successful, in spite of excellent results obtained elsewhere; and a Japanese coal other than Yubari is just now being tried at our Works. The cost for C.W. gas was rather less owing to smaller output. Like other gas companies, we find water gas expensive to manufacture; but as we have so far only succeeded in finding a market for part of our coke available for sale, it is necessary to use up coke by making water gas.

Working expenses are higher, mostly through cost of wages and salaries. Discounts also come under this head; the total for same being increased mostly in connection with military accounts. We allow discounts to consumers on a sliding-scale ranging from 2½ to 12½ p.ct., and find the scheme of considerable help. Retort maintenance was up, due to necessary repairs effected at both works. The increase in main maintenance is due to extra labour. Maintenance of works is considerably down, as repairs of a special nature were made in 1926. Bad debts were about the same as in 1925; the higher figure for 1926 was due to abnormal causes.

The costs for publicity and showrooms were about the same as before. We have a very fine showroom in the central part of the town, as the photographs available for your inspection will show. Special consideration is being given to the question of a more intensive campaign in propaganda and publicity. The debit for bonus to staff and workmen is higher, that for provident fund about the same. The Board attach importance to these two schemes, which ought to make for good feeling among our employees.

Gas rentals advanced from $525,214 to $574,372, but about $8000 allocated to public lamp maintenance last year, and included under meter and fittings rental, is now properly included in gas rentals. The apparent diminution in meter and fittings rentals is accounted for by the reason I have just given.

Residual products show an increase from $61,581 to $132,987; the difference being more than the extra cost of coal, as previously stated. There are several reasons for this, mainly the extra tonnage of coal and extra make per ton from Indian coal. Rates also were higher, although prices were not so favourable as we had hoped and expected. I mentioned at last meeting that the price of coke had been advanced to $25 per ton; but this rate could not be maintained, and the average for year at Hong Kong was $23 and at Kowloon $20. The long-sustained efforts we have made regarding our residuals will, I hope, prove successful. The credit in the accounts is equivalent to 57 p.ct. on coal cost, but, of course, the coke used for water gas is included. In previous year the percentage was 35 p.ct. only, including coke for water gas.

Exchange was against us; the average rate being 1s. 11⅞d. per $ as compared with 2s. 2¼d. per $. I think further comment on the accounts is not necessary. The balance of net revenue is £45,844 12s. 3d.; and a dividend of 10 p.ct. per annum free of income-tax is recommended, less the interim dividend of 5 p.ct. paid in October last.

At our last meeting I stated that at or about this time, we hoped to submit new Articles of Association to you for approval. Notices will shortly be sent out calling the extraordinary general meetings required to pass the necessary resolutions thereon.

At the request of the Board, the Secretary visited Hong Kong at the end of last year to study the works, the office system, and the business generally; and the Directors have found his report thereon extremely useful.

I am pleased to refer to the presence with us to-day of Mr. Blackburn, our Manager at Hong Kong. Mr. Blackburn was due for leave last year, but in consequence of staff troubles, it was found necessary for him to stay on; and we hope he will now enjoy his holiday. With these remarks, I have pleasure in moving that the report and accounts be received and adopted.

Mr. Strachan C. Clarke seconded the resolution, which, after the Chairman had replied to a few questions, was unanimously carried.

The Chairman then moved the following resolution:

> That a dividend at the rate of 10 p.ct. per annum free of income-tax be declared for the year ended Dec. 31, 1927, less interim dividend paid Oct. 13, 1927, the warrants to be made payable on April 21, 1928,

which was seconded by Mr. Leonard Askew and carried unanimously.

The re-election of Major Heriot R. Glen as a Director of the Company was proposed by the Chairman, seconded by Mr. Strachan C. Clarke, and unanimously carried.

Major Glen expressed his thanks for re-election.

Mr. H. King-Hiller proposed the re-election of Messrs. Cash, Stone, & Co. as Auditors for the current year, at their usual fee of

fifty guineas, which was seconded by Mr. R. M. Long and carried unanimously.

The Chairman proposed a vote of thanks to the staff in London and Hong Kong, which was seconded by Mr. Alfred W. Oke and carried unanimously. Mr. Blackburn, the Company's Manager, responded on behalf of the local staff, and said that, after the two or three strenuous years which had passed in Hong Kong, he thought the tide had turned and that further increases in business and better working could be anticipated. He said the bonuses to local staff and the provident fund were doing very much to make them keenly interested in furthering the progress of the Company. The Secretary also expressed his thanks.

A vote of thanks to the Chairman and Directors was proposed by Mr. R. M. Long, seconded by Mr. H. King-Hiller, and carried unanimously. The Chairman briefly responded, and the proceedings then terminated.

COLOMBO GAS AND WATER COMPANY, LTD.

ANNUAL MEETING.

The Annual General Meeting of the Company was held at 148, Gresham House, Old Broad Street, E.C., on Monday, April 23, 1928—Mr. Strachan C. Clarke, Chairman, presiding.

The Secretary (Mr. A. C. Pullen) read the notice convening the Meeting and the Auditor's Report.

The Chairman said: A copy of the Report and Statement of Accounts having been sent to all the Shareholders, I will ask you to take them as read.

The general trade of Ceylon during the year ended Dec. 31 last was in a prosperous condition and this has reflected on our own business. As I indicated at our last Meeting, the Government have purchased the Plant of the Electric Company in Colombo and there can be little doubt that the Government's Electric Schemes will cause serious competition to us in the lighting portion of our output at some time in the future. But during the past few years the Company have carried out considerable extension work and consumption of gas for cooking is being largely increased through our Scheme for fixing Cookers free; the number of Cookers in use being increased by 32 p.ct. during the twelve months. Cheap price of gas for cooking has also helped considerably; and this is made possible only by strenuous efforts for low working costs. The sales of gas increased by 22 p.ct. for the twelve months and in the Report we have specially drawn your attention to the fact that the figures for lighting were 75 p.ct. more than in 1920. Those acquainted with Colombo will specially appreciate what this statement means and will know the thought and energy necessary to produce such a result. Details of the lighting installations carried out during last year are on the table.

The Schemes prepared by the Manager for conversion of two of the old Holders on the Works have proved very successful and the capacity of the present plant can be regarded as ample for many years, excepting that we may perhaps need some minor expenditure for increasing the retort capacity. We have a really model Works; every detail being planned with care and an eye to strict economy. After all, success or failure of a gas undertaking depend largely upon wise attention to capital expenditure, looking ahead, but avoiding outlay on anything lavish or redundant. On May 17, an up-to-date and well-equipped Showroom at Wellawatte, in the Southern part of Colombo, was opened and photographs of same are available for your inspection.

On turning to the Accounts, you will find that the additions to Capital expenditure amounted to £10,891, which sum includes £3341 for New Mains and £5331 for No. 1 Holder, part of the expenditure on this Holder being charged against the Reserve for Renewals.

The cost of Coal increased by Rs.42,201. We used 1500 tons more and freight rates were higher. These rates have now fallen considerably and, with a lower f.o.b. price for the Coal, the position as to cost per ton is favourable for the current year. The average make of gas during 1927 was 19,800 per ton, of 450 B.Th.U. Working Expenses show a lesser total but the cost of Bonuses paid to the Local Staff and Workmen is shown separately on this occasion, as the item happily is growing to a really large total. Wages Fitting Work is higher on account of more installations. The profit shown on the other side of the account to Gas Fittings is increased considerably. Bad Debts written off were more, but the cost represents about a fifth of one per cent. on the year's Revenue, which result reflects great credit on our Staff.

The charge for Wellawatte Showroom includes cost of the building and the equipment, with the current expenses since it was opened. Bonus account is now shown separately, as mentioned before. The Provident Fund debit is less, because the amount last year included initial cost of the Scheme. The Board attach importance to the Bonus Scheme and the Provident Fund for Local Staff, as both should foster good feeling between the Company and its Employees.

On the credit side of the Revenue, Gas Rentals increased from Rs.744,294 to Rs.894,562. Our Sales went up by 42¾ Million c.ft. during the year. Residual Products receipts were slightly more, the quantities of Coke and Tar sold being much higher. But on the other hand, prices had to be reduced considerably. The total net receipts are 85 p.ct. on cost of Coal, which percentage is not so favourable as for 1926. Apparently we have reached a point when we cannot dispose of the larger amount of Residuals we are handling at prices ruling in previous years. The disposing of our Coke and Tar is a matter which is receiving constant consideration. The very favourable return from Residuals on cost of Coal is due, of course, to the Manager's keen and close working at Colombo also to the negotiations for Coal conducted here by the Secretary.

The credit to Gas Fittings is higher because of a larger number of installations made. I have already referred to the lists of these, which are available for your inspection. The Books and Accounts are now kept on a basis for the local currency of 1s. 6d.; this being the par value of the Rupee. It is a pleasure to mention the Company's satisfactory financial position at Dec. 31 last. The Balance Sheet will show you that our Cash Investments, Stores, and Debtors amounted to a total of £94,744, whilst, on the other hand, the cash liabilities were £35,981, showing a surplus of £58,763. The Capital Expenditure on Land and Works now stands at £572 per Million c.ft. made—a satisfactory figure. But, of course, the Works are designed for a much greater output than the present. The Debenture Debt has been reduced since the beginning of the year to £800 and will be quite cleared off on July 1 next. No fresh Capital has been raised since 1900 and the gas made is now between six and seven times greater than then. I think these are all the comments I need make on the Accounts, though, of course, I shall be pleased to answer any questions thereon which you may care to put to me.

The Balance of Net Revenue is £40,163 13s. 5d.; and the Directors recommend a final Dividend of 3½ p.ct. on the Preference Shares, less tax, and a final Dividend on the Ordinary Shares of 5 p.ct., free of tax, also that £20,000 be added to General Reserve. The General Reserve account will then stand at £55,623.

At the Board's request, the Secretary visited Colombo Works at the end of last year and the Directors are of opinion that the information afforded to them as a result of the visit will be of the greatest help to the Company in the future.

I usually conclude my remarks with a special reference to the services rendered to the Company by our Manager, Mr. Johnson. He is on leave from Colombo at present; and I welcome his presence with us to-day. I can only reiterate my previous remarks to you about the exceptional working results being obtained at Colombo, which still further improve as time passes. Mr. Johnson's very economical Schemes for alterations to, and enlargement of, our Plant are proving highly satisfactory and his propaganda work is most helpful in spreading the use of gas. The Board hope that the time when he will cease to serve the Company as Engineer and Manager may be at least some years ahead. With these remarks, I have pleasure in moving that the Report and Accounts be received and adopted.

Mr. John G. Wardrop seconded the resolution, which, after congratulatory comments on the results had been made by Shareholders, was unanimously carried.

The Chairman then moved the following Resolution:

> That a Dividend for the year ended Dec. 31, 1927, at the rate of 7 p.ct. per annum upon the Preference Shares, less Income Tax and 10 p.ct. per annum upon the Ordinary Shares, free of Income Tax (both less Interim Dividend paid Oct. 11, 1927), be and is hereby declared, the Warrants to be payable on April 28, 1928.

which was seconded by Mr. Alex. A. Johnston and carried unanimously.

The Chairman: I have now a very pleasant Resolution to put before you in proposing the re-election of Mr. John G. Wardrop as a Director. Mr. Wardrop is a very old and esteemed friend of us all, and before joining the Board was on the Local Committee in Colombo for 25 years. With his knowledge of Colombo affairs, he is of the greatest assistance to us.

The Resolution was seconded by Mr. Robert H. Glen and carried unanimously.

Mr. Wardrop expressed his thanks for re-election and mentioned that he had been associated with the Company for fifty years and had seen its ups and downs. Mr. Phillips came along and remodelled the Works and the Company then came round the corner. It is most satisfactory to see the Company in such a sound financial position and having such a capable Manager.

Major Heriot R. Glen proposed that Mr. William Cash, Junior, M.A., F.C.A., be re-elected as Auditor for the current year at the fee of Seventy guineas, which was seconded by Mr. A. J. Kingdon and unanimously carried.

The Chairman proposed a Vote of Thanks to the Staff in London and Colombo, which was seconded by Mr. John G. Wardrop. After Mr. A. A. Johnston, Mr. H. G. Edwards and Mr. A. J. Kingdon had expressed their desire to associate themselves with the Chairman's remarks, the Resolution was carried unanimously. The Manager, in acknowledging the vote on behalf of the Local Staff, said: We have just listened to the Chairman's very full remarks on the Company's business. I should like to add that, in my opinion, the Company has one of the best running Works operating out East. The present-day working results which we have established denote as high a level in Gas-Works practice as can be found anywhere in the World. In returning thanks, on behalf of the Staff at Colombo, I would say that when we all know what a kind and considerate Board we have in London, to say nothing of the indefatigable Secretary, who keeps me posted up with the latest gas news and with whom it is such a pleasure to transact correspondence, we are thus urged on to give our best not only to the Company which we serve and which in turn serves us, but to the Gas profession as a whole. The Secretary also responded briefly and mentioned how very satisfactory he had found the Company's Works and affairs at Colombo.

A Vote of Thanks to the Chairman and Directors was moved by Mr. H. G. Edwards, seconded by Mr. A. J. Kingdon and carried unanimously.

The Chairman responded and the proceedings terminated.

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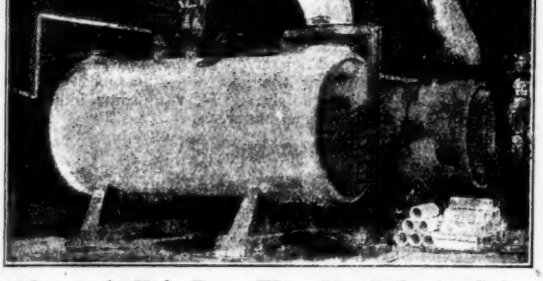

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COAL PURCHASING.

A Glasgow Resolution.

At a meeting of the Glasgow Corporation on April 12, Mr. BRUCE MURRAY opposed a recommendation by the Gas Committee that the General Manager of the Gas Department, Mr. J. W. McLusky, be authorized to purchase the coal supplies required for the ensuing year. This, he contended, was a departure from the practice and principles of the Corporation. Purchase by tender was the safest, best, and cheapest method, and the only way by which the members of the Corporation could have any control whatever over expenditure. He was opposed to the giving of such wholesale power to any individual. He moved disapproval of the minute.

Mr. M'NEILL seconded.

Mr. DOLLAN, supporting the amendment, said it was entirely justified. The Department purchased 800,000 tons of coal every year, representing approximately an expenditure of £500,000; and it was proposed to hand over to a single individual complete authority to spend this sum. With all due respect to the Gas Manager, the Corporation had no right to put into the hands of one individual the economic authority represented by this decision.

Mr. WALKER, supporting the minute, pointed out that the coal industry was in a state of flux, and they were not likely to get normal conditions for a considerable time to come. Alluding to the pooling arrangement on the part of the coal owners, he said it had been laid down that all gas undertakings were to be charged 2s. per ton extra. Were they as a Corporation calmly to sit down and submit to that? Increased price of coal meant more to the Gas Department than the Electricity Department, for any substantial rise in the price brought a corresponding increase in the price of gas. Under normal conditions it would be absolutely right to take tenders. But suppose they asked for tenders to-day, those engaged in the coal trade would not be allowed to make a tender different from the price laid down by their Association. The Department had been able through the Manager to negotiate, in consultation with the Conveners all the time, large purchases of coal at a much cheaper price than that asked for by the tenderers. The Manager would be in constant consultation with the Conveners of the Committees, and the members could rest satisfied that this was being done for the benefit of the Department and in the interests of the Corporation.

Mr. DRUMMOND remarked that the Gas Department were working under special conditions at the present moment. Last year the same procedure was adopted, and the Manager secured coal at a much lower figure than it could have been obtained otherwise. The Department were to be congratulated on courageously adopting this policy.

Mr. J. B. PATERSON, replying to the discussion, said the arrangement forced upon them by the exceptional circumstances had been of great advantage to the Department in the past.

On a division, the minute was carried by forty votes to seventeen.

HEATING ENGINEERS VISIT WATSON HOUSE.

Members of the Institution of Heating and Ventilating Engineers, on April 4, visited Watson House, where they were welcomed by Mr. Stephen Lacey, Deputy Controller of Gas Sales to the Gas Light and Coke Company.

The members then visited the various rooms, where brief lectures and demonstrations were given. In the lecture room experiments on the lagging of gas-fired water heaters were described by means of curves. The application of gas to refrigeration, and methods employed for ensuring accurate screw threads, were explained. Demonstrations showed clearly that there is much room for improvement in the screwing of some pipes and pipe fittings. The Company have set a high standard; and in course of time this influence is likely to be widely felt, to the benefit of the whole of the tube industry and to the users. All dies used by the Company's fitters are tested at Watson House before issue.

In the water heater room was an interesting display of geyser sections, which form part of the facilities used in teaching gasfitters the art of geyser fixing and maintenance. An interesting demonstration was made to show the importance of flue equipment. In the workshops it was noticed that sheet aluminium was largely used for hoods, cowls, &c. In the training shop, in which no fewer than one hundred apprentices each year commence a six years' course, work was in progress on lead, brass, copper, and wrought iron. In the fittings testing room malleable iron fittings were seen being tested under an air pressure of 100 lbs. per sq. in., and brass fittings with air at a pressure of 100 in. water head.

After a visit to the various laboratories, in which physical and chemical tests are made, the members assembled in the lecture room, where the President, Mr. S. Booth Horrocks, took the chair, and Mr. J. G. Clark explained to the members the purpose of the research work and training carried out at Watson House. The President then proposed a vote of thanks to the Governors and Directors of the Company, which was seconded by Mr. E. R. Dolby and carried with acclamation.

GAS REGULATION ACT APPLICATIONS.

DECLARATION OF CALORIFIC VALUE.

Harrogate Gas Company.—460 B.Th.U., in the Boston limits and certain specified parishes in the added area. (Jan. 1, 1929.)

Worthing Stock Issue.—The tenders for the £25,000 5½ p.ct. irredeemable preference stock which Messrs. A. & W. Richards offered on behalf of the Directors of the Worthing Gas Light and Coke Company were opened on April 17. The issue was considerably over-subscribed at prices ranging from £100 down to the minimum of £95 per £100, and the average price obtained was £96 16s. 11d. p.ct.

METROPOLITAN GAS COMPANIES' OFFICIAL TESTINGS.

The Gas Referee's Reports of the official testings for the past quarter give the following average calorific values for the gas supplied by the Metropolitan Companies named.

Commercial Gas Company.—503·5 B.Th.U. (declared calorific value, 500 B.Th.U.).

Gas Light and Coke Company.—502·4 B.Th.U. (declared calorific value, 500 B.Th.U.).

South Metropolitan Gas Company.—562·4 B.Th.U. (declared calorific value, 560 B.Th.U.).

South Suburban Gas Company.—502·1 B.Th.U. (declared calorific value, 500 B.Th.U.).

Tottenham District Light, Heat, and Power Company.—502·7 B.Th.U. (declared calorific value, 500 B.Th.U.).

Wandsworth, Wimbledon, and Epsom District Gas Company.—473·8 B.Th.U. (declared calorific value, 470 B.Th.U.).

A SMALL COMPANY AND PUBLICITY.

In "Town and Country News" for April 6, there is a short article by Bertram Inglestone on "Gas: The Fuel of the Future." There is nothing in the article that constitutes news to the readers of the "JOURNAL;" and yet it is just one of those little pieces of publicity that catch the eye and arrest the mind. It tells the readers of our popular contemporary of the increasing popularity of, and demand for, gas that is constantly going on. It tells, too, of the economy and efficiency with which the gas industry deals with a ton of raw coal. It speaks of the advantages of gas and its adaptability. It concludes: "In country districts, gas has brought the boon of convenient and good lighting and heating to many. It has, too, provided the farm, the bakery, and so on, with a ready means of mechanical power. One undertaking which is now meeting the needs of country residents is the Eynsham Light, Heat, and Power Company, Ltd. This concern, although a comparatively small one, is doing very valuable work, for its chief competitor is the old, unsatisfactory oil-lamp and oil-stove. The present concern came into existence last autumn when it succeeded the old Eynsham Gas Company, Ltd. It is under the direction of expert engineers. Reorganization has been carried out, the plant brought up to date, every effort is being made to ensure that while a reasonable return on the privately-subscribed capital is obtained, the legitimate demands of the Eynsham residents shall be fully met."

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *April* 23.

There is a moderate amount of inquiry for pitch for this season's shipment, and the price remains steady at not below 65s. per ton f.o.b.

Creosote is unchanged at about 8½d. per gallon, delivered alongside steamer.

Pure benzole is 1s. 5d. to 1s. 6d. per gallon, pure toluole about 1s. 10d. per gallon, 95/160 solvent naphtha 1s. 3d. per gallon, and pyridine 5s. 6d. to 6s. per gallon.

Tar Products in the Provinces.

April 23.

The average prices of gas-works products during the week were: Gas-works tar, 46s. 9d. to 51s. 9d. Pitch—East Coast, 62s. 6d. to 65s. f.o.b. West Coast—Manchester, 60s. to 62s. 6d.; Liverpool, 62s. 6d. to 65s.; Clyde, 65s. to 67s. 6d. Toluole, naked, North, 1s. 3d. to 1s. 4d. nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 8¾d. to 9¼d. Heavy naphtha, North, 8¾d. to 9¼d. Creosote, in bulk, North, liquid, 7¾d. to 7¼d.; salty, 7d. to 7¼d.; Scotland, 7¼d. to 7¼d. Heavy oils, in bulk, North, 8¾d. to 9¼d. Carbolic acid, 60 p.ct., 2s. 3d. to 2s. 4d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Benzole Prices.

There is no change to report from the prices published on April 4.

CONTRACTS OPEN.

Coal.

The Workington Gas Committee invite tenders for the supply of gas coal. [See advert. on p. 264.]

The East Dereham Urban District Council invite tenders for the supply of screened gas coal or nuts. [See advert. on p. 264.]

Gas Engine, &c.

The Birmingham Tame and Rea District Drainage Board invite tenders for the supply, delivery, and erection of a 400-B.H.P. vertical multi-cylinder gas engine and direct coupled alternator. [See advert. on p. 264.]

Issue of Stock at Uxbridge.—The Directors of the Uxbridge, Maidenhead, Wycombe, and District Gas Company have authorized Messrs. A. & W. Richards to offer for sale by tender £50,000 5 p.ct. perpetual debenture stock; the minimum price being £94 per £100. Tenders should arrive at Messrs. Richards, 37, Walbrook, E.C. 4, not later than eleven o'clock on Thursday, May 10. The minimum amount of stock which may be tendered for is £25. Above this, tenders may be in multiples of £5.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

Business opened out quite hopefully after the Easter holiday, and prospects are regarded as somewhat brighter than for some time past. Inquiry is satisfactory, and outputs are generally well booked for the next few weeks. Very little is being done for positions further ahead; but the market is not without hope that it may be more successful than of late in some of the pending export contracts, as the position is not too clear at present with some of our most formidable competitors.

Gas coals are being well taken, and noticeably seconds have been in better demand. Prices remain unchanged; Wear Specials being quoted 15s. 6d. to 16s. f.o.b., best qualities 15s., and seconds 13s. 6d. to 13s. 9d. Durham coking has remained in good request, and unscreened is quoted at 13s. 6d. to 13s. 9d. for good brands. Best Durham bunkers are well booked, and have little to offer for the next few weeks. They are nominally about 14s. 9d., with seconds quiet around 13s. 6d. In Northumberlands there has been good inquiry for best steam brands, which are steady at 13s. 6d.

The coke market is quiet, and 19s. to 19s. 6d. f.o.b. is asked for shipment.

YORKSHIRE AND LANCASHIRE.

Gas coals have been moving very freely for forward purchases at figures in advance of those of last year.

The Five Counties Scheme is presenting difficulties both to the producer and the consumer, and the key industries are faced with a possible increase in the cost of fuel.

The industrial trade generally has been rather spasmodic, with figures indicative of the position at each supplying colliery.

The domestic trade during the past week has been up to the average. Prices have been fairly steady, with some indications of slight advances for secondary qualities.

MIDLANDS.

The tug-of-war has begun between the collieries banded together in the Five Counties Scheme and the consumer. Higher quotations are stopping business. Advances of 1s. and 1s. 6d. are being asked on steam coals as well as some other grades; but there is no authentic record of buyers having submitted to them.

For the time being the consumer is in a strong position. It would hardly have been possible to choose a more unpropitious time for an attempt to screw up prices. Householders are not in the least disposed to buy beyond their minimum requirements. In the vicissitudes through which the trade has passed in recent years the advantage has been with those users who have deferred buying till they wanted coal for consumption; in any case, there is no anxiety at this season about the renewal of stocks. Early requirements are generally covered in the industrial market, while the gas and electricity undertakings have insured themselves for a considerable time ahead.

With substantial supplies at the pithead and in intermediate hands, it has been hardly possible to test how far the 65 p.ct. quota approximates actual consumption; the holiday season being a disturbing factor. It is reported that some collieries are over-sold, and that they are endeavouring to transfer part of their commitments to others in the scheme.

The point of immediate interest is that, though quotations have been stiffened up, consumers have, so far as can be ascertained, stood their ground, aided by comparatively free market conditions. It is stated, however, by merchants that in its first month the Five Counties Scheme has worked with more cohesion than any previous attempt at control.

TRADE NOTES.

Messrs. Edward Cockey & Sons, Ltd.

Messrs. Edward Cockey & Sons, Ltd., have now closed their London offices; and the whole of their business will in future be dealt with from the Head Office, at Garston Works, Frome, Somerset. Mr. H. King Hiller has accordingly ceased to act as the representative of the firm.

Holmes' Index File.

Messrs. W. C. Holmes & Co., Ltd., have forwarded an index file which they are issuing to gas engineers for the purpose of forming an easy means of filing copies of brochures and data sheets on technical matters, which the firm are in the habit of sending out from time to time. The case has been designed so as to be accommodated in an ordinary bookcase, and has been generally appreciated by the recipients. In sending out the case, the firm have taken the opportunity to dispatch a new brochure on their "Western" faced valves, which contains a full list of dimensions of the old standard and the new flange standard now adopted by the British Engineering Standards Association, and approved by The Institution of Gas Engineers and the Society of British Gas Industries, arranged so that a comparison can easily be made for any size of flange. Messrs. Holmes will be pleased to forward to any readers of the "GAS JOURNAL" who are interested in the matter further copies of this sheet.

The North Tawton Parochial Council have rejected a scheme for heating the Parish Church by electricity on the ground of expense, and unanimously agreed to heat the church by gas radiators. The Secretary was instructed to communicate with the local Gas Company with a view to getting the work done.

Further News Items appear on p. 262.

STOCK MARKET REPORT.

THE listing of the 4 p.ct. Funding Loan on the New York Stock Exchange was perhaps the outstanding event of the past week.

As shown in the Table, all the variations in the quotations were in an upward direction; the most important being 3½ points on Imperial Continental ordinary, and 3s. 6d. on Primitiva ordinary. These rises are probably due to the publicity they have recently received in the "Financial News." There is little doubt that the former Company's financial position is particularly sound, and further improvements may be expected. In the latter Company, however, it must be remembered that, while extraordinary progress has been made in the last few years, twelve months may probably elapse before there is any renewal of dividend distribution. The accounts of the Imperial Continental Gas Association and of the Bombay Gas Company were issued during the week, and both undertakings show satisfactory progress.

The following transactions were recorded: On Monday, Aldershot 73, Alliance and Dublin 95⅝, Brighton and Hove 6 p.ct. 117½, Bristol 5 p.ct. 86½, Commercial 98¾, 99½, Continental Union 7 p.ct. preference 92, Gas Light and Coke 18s. 4½d., 18s. 6d., 18s. 6¾d., Imperial Continental 153½, 154, 155, Primitiva 23s. 6d., 23s. 7½d., 23s. 9d., 23s. 10½d., 23s. 11¼d., 24s., 24s. 1½d., 24s. 3d., South Metropolitan 105, Tottenham "B" 94, Wandsworth 3 p.ct. debenture 58½. Supplementary prices, Cheltenham 5 p.ct. 70½, Southend-on-Sea 4 p.ct. debenture 73½, Wandsworth 5 p.ct. debenture 99¾.

On Tuesday, Alliance and Dublin 95, Bournemouth "B" 12⅜, British 115, 115½, Cape Town 4½ p.ct. debenture 75, Commercial 99, 99½, 99⅝, Continental Union 30, 7 p.ct. preference 93, Gas Light and Coke 18s. 4¼d., 18s. 6d., 18s. 6¾d., 18s. 7½d., Imperial Continental 155½, 156, 3½ p.ct. debenture 69, Newcastle 3½ p.ct. 16s. 3d., North Middlesex 6 p.ct. 99, 99¾, Primitiva 23s. 9d., 23s. 10½d., 24s., 24s. 1¼d., 24s. 2¼d., 24s. 3d., 24s. 4½d., 24s. 5¼d., 24s. 6d., 24s. 7¾d., South Metropolitan 105, 105¼, 105½, 106, Tottenham "A" 114, "B" 94, Uxbridge 5 p.ct. 89. Supplementary prices, Croydon 7½ p.ct. preference 101½, 102, Leatherhead 6 p.ct. preference 102½, 102¾, Southend-on-Sea 4 p.ct. debenture 74½, Tottenham 6 p.ct. 99, 99½, Wandsworth 5 p.ct. debenture 99½, 99¾, Yorktown and Blackwater 5½ p.ct. debenture 101.

On Wednesday, Bombay 22s. 9d., 23s. 6d., British 115, Commercial 98½, 99¾, Continental Union 30, 32, Gas Light and Coke 18s. 4½d., 18s. 6d., 18s. 6¾d., 4 p.ct. preference 78½, 79½, Imperial Continental 155½, Maidstone 5 p.ct. 109, Primitiva 24s. 6d., 25s., 25s. 1½d., 25s. 3d., 25s. 4½d., 25s. 6d., 25s. 7½d., 25s. 9d., 4 p.ct. consolidated debenture 75, South Metropolitan 105, 105¼, 105¾, 106, South Suburban 5 p.ct. 106, Southampton 78½. Supplementary prices, Leatherhead 6 p.ct. preference 102½, 102½, 102¾, Southgate 7½ p.ct. debenture 101½, 102.

On Thursday, Brighton and Hove 6 p.ct., 117, Cape Town 4½ p.ct. debenture 76, Commercial 3 p.ct. debenture 60, Croydon sliding-scale 108, maximum dividend 82½, Gas Light and Coke 18s. 4½d., 18s. 6d., 18s. 6¾d., 18s. 7½d., 3½ p.ct. maximum 65, 3 p.ct. consolidated debenture 62, Liverpool 7 p.ct. preference 102, Primitiva 25s. 6d., 25s. 9d., 26s. 1½d., 26s. 3d., 26s. 4½d., 26s. 6d., 26s. 7½d., 26s. 9d., 27s., 27s. 1½d., 27s. 4½d., 27s. 6d., 27s. 9d., 28s., 28s. 3d., 28s. 4½d., 28s. 6d., 28s. 9d., 28s. 10½d., 29s., 29s. 6d., 4 p.ct. consolidated debenture 76, 4 p.ct. debenture (1911) 76, South Metropolitan 105½, Southampton 5 p.ct. 79½. Supplementary prices, Croydon 4 p.ct. debenture 78¾, Liverpool 5 p.ct. 88¾, Southend-on-Sea 4 p.ct. debenture 74½.

On Friday, Brighton and Hove 6 p.ct. 118, Continental Union 31, 7 p.ct. preference 93, 94, Croydon maximum dividend 83½, Gas Light and Coke 18s. 4½d., 18s. 6d., 18s. 6¾d., 18s. 7½d., 3½ p.ct. maximum 64, 4 p.ct. consolidated preference 78½, 78¾, 79, Imperial Continental 156, 158, 158¼, 158¾, Newcastle 3½ p.ct. 16s. 10½d., 17s. 1½d., Portsmouth 5 p.ct. 78, Primitiva 26s. 9d., 27s., 27s. 1½d., 27s. 3d., 27s. 4½d., 27s. 6d., 27s. 7½d., 27s. 9d., 28s., 28s. 3d., 28s. 6d., 29s. 3d., South Metropolitan 104¾, 104¾, 105¼, 105⅜, Southampton 4 p.ct. debenture 75, Uxbridge 5 p.ct. 92, Wandsworth "B" 111½. Supplementary prices; Derby 5 p.ct. 110½, Reading 5 p.ct. maximum 82½, 83, Wandsworth 5 p.ct. debenture 100.

The rise in the re-discount rates of Boston and Chicago Federal Banks dispelled any hope of a reduction in the Bank Rate last week. Discount rates closed higher, and a further rise is anticipated. Rates for new loans ranged from 3½ p.ct. down to 3 p.ct., while old day-to-day loans were generally renewed at 3¼ p.ct. Treasury Bills were allotted at £4 1s. 1·58d. p.ct., or just over 5d. p.ct. above the previous week's rate.

There was considerable activity in the American Exchange on Friday, the rate closing at 4.88 7/32. A recovery occurred in the Belgian currency, the Brussels rate declining to 34.96½. Dutch florins were weaker at 12.11½. Italian lire closed at 92.60; German marks at 20.41½; and pesetas at 29.10½. The French rate was unchanged at 124.

Silver was cheaper on Continental sales at 26 7/16d. per oz., and Gold remained at 84s. 11½d.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21, 1927. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2¼ p.ct. at call and 2¾ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Apl. 20.	Rise or Fall on Week.	Transaction Lowest and Highest Prices.
£			%p.a	% p.a.				
191,978	Stk.	Feb. 9	5	5	Aldershot 5 p.c. max. C.	70—75	..	73
412,932	,,		4	4	Do. 4 p.c. Pref.	69—72	..	..
1,561,868	,,	Apl. 12	7	7	Alliance & Dublin Ord.	93—96*	..	95—95½
374,000	,,	Jan. 12	4	4	Do. 4 p.c. Deb.	64—67	..	..
522,654	,,	Mar. 8	7	7	Barnet Ord. 7 p.c.	109—112	..	..
800,000	1	Oct. 13	1/7½	1/7½	Bombay, Ltd.	22/—24/-	..	22/9—23/6
170,000	10	Mar. 8	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
600,050	10	,,	7	7	Do. B 7 p.c.	12—12½	..	12⅝
375,050	10	,,	6	6	Do. Pref. 6 p.c.	10½—11	..	..
50,000	Stk.	Jan. 12	3	3	Do. 3 p.c. Deb.	56—60	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	..	..
857,900	,,	Mar. 8	7½	7½	Brighton & Hove 6 p.c. Con.	115—118	..	117—118
311,880	,,		6/8/6‡	6‡	Do. 5 p.c. Con.	103—106	..	..
1,387,500	,,	Feb. 23	5	5	Bristol 5 p.c. max.	87—88a	..	86½
865,000	,,	Mar. 22	8	8	British Ord.	113—116	..	115—115½
100,000	,,	Dec. 22	7	7	Do. 7 p.c. Pref.	114—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—75	..	..
200,000	,,	,,	—	33/3	Do. 5 p.c. Red. Deb.	93—96	..	..
100,000	10	Nov. 24	8	6	Cape Town, Ltd.	8—9	..	..
100,000	10	Oct. 27	4½	4½	Do. 4½ p.c. Pref.	6¾—7¾	..	..
150,000	Stk.	Dec. 22	4½	4½	Do. 4½ p.c. Deb.	72—77	..	75—76
626,880	,,	Feb. 23	6	6	Cardiff Con. Ord.	98—101	..	..
237,880	,,	Jan. 12	7½	7½	Do. 7½ p.c. Red. Deb.	101—104	..	..
167,180	,,	Oct. 13	6½	6½	Chester 6 p.c. Ord.	87—92b	..	..
79,185	1		‡2/-	‡2/-	Colombo Ltd. Ord.	31/—33/-	..	..
84,495	1		1/4‡	1/4‡	Do. 7 p.c. Pref.	20/—22/-	..	..
375,402	1	Apl. 12	1/9‡	1/9‡	Colonial Gas Assn. Ld. Ord.	23/—25/.*	..	..
187,844	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/.*	..	..
9,073,290	Stk.	Feb. 23	5	7	Commercial Ord.	97—100	..	98¾—99¾
475,000	,,	Dec. 22	8	8	Do 8 p.c. Deb.	57—60	..	60
800,000	,,	Sept. 29	‡1	‡1	Continental Union, Ltd.	29—34	+1	30—32
200,000	,,	Mar. 8	7	7	Do. 7 p.c. Pref.	88—93	..	92—94
787,560	,,	Mar. 8	6½	7	Croydon sliding scale	105—108	..	108
408,100	,,	,,	5	5	Do. max. div.	81—84	..	82½—83½
492,270	,,	Mar. 8	7	10	Derby Con.	110—115e	..	..
55,000	,,	Dec. 22	4	4	Do. Deb.	71—78e	..	..
209,000	,,	Mar. 8	5	5	East Hull Ord. 5 p.c.	76—79	..	..
50,000	,,	Dec. 22	5	5	Eastbourne 5 p.c. Deb.	90—95	..	..
1,902,180	10	Mar. 22	‡4	‡6	European, Ltd.	8—9	..	..
15,703,480	Stk.	Feb. 9	5	5/1/4	Gas Light & Coke 4 p.c. Ord.	18/4½—18/10½f	..	18/4½—18/7½
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	63—65	..	64—65
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	77—80	..	78½—79½
5,602,620	,,	Dec. 22	8	8	Do. 8 p.c. Con. Deb.	60—62	..	62
181,815	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	102—105	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	99—101	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 8	6½	6½	Hastings & St L. 5 p.c. Conv	87—90	..	..
258,740	,,	,,	5½	5½	Do. 8½ p.c. Conv.	68—71	..	..
70,000	10	Oct. 13	‡10	‡10	Hongkong & China, Ltd.	13½—14½	..	..
173,300	Stk.	Mar. 8	5	5	Hornsey Con. 8½ p.c.	78—81	..	..
1,976,000	,,	Nov. 10	10	10	Imperial Continental Cap.	154—159	+3½	153½—156½
223,130	,,	Feb. 9	8½	8½	Do. 8½ p.c. Red. Deb.	68—70	..	69
335,242	,,	Mar. 8	7	7	Lea Bridge 5 p.c. Ord.	94—97	..	..
3,145,907	,,	Feb. 23	6½	6½	Liverpool 5 p.c. Ord.	88—89b	..	..
600,000	,,	Mar 22	7	7	Do. 7 p.c. Red. Pref.	101½—103½b	..	102
165,736	,,	Feb. 23	9	8	Maidstone 5 p.c. Cap.	108—111	..	109
75,000	5	Dec. 22	‡7	‡8	Malta & Mediterranean	5s—6	..	..
541,920	Stk.	Nov. 24	‡7	‡8	Montevideo, Ltd.	92—94	..	..
2,061,315	,,	Mar. 8	5	5	Newcastle & Gateshead Con	16/6—17/-df	..	16/9—17/1½
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	66½—67½d	..	..
691,705	,,	June 29	8½	9½	Do. 8½ p.c. Deb.	66½—67½d	..	..
131,780	,,	Mar. 8	6/18/0	6/18/0	North Middlesex 6 p.c. Con.	97—100	..	99—99¾
300,000	,,	Nov. 24	7	9	Oriental, Ltd.	116—121	..	..
189,130	,,	Dec. 22	7½	7½	Plym'th & Ston'house 5 p.c.	102—107	..	..
414,500	,,	Feb. 23	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	101—104	..	78
386,732	,,	,,	5	5	Do. 5 p.c. max.	77—80	..	..
2,334,464	1	—	—	—	Primitiva Ord.	26/6—27/6	+3/6	28/6—29/6
244,500	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb.	92—95	..	..
695,000	Stk.	Jan. 26	4	4	Do. 4 p.c. Red. Deb. 1911	75—77	+1	76
416,345	,,	Dec. 22	4	4	Do. 4 p.c. Cons. Deb.	75—77	+1	75—76
160,000	10	Mar. 22	6	6	San Paulo 6 p.c. Pref.	8—8½	..	..
125,000	50	Jan. 3	5	5	Do. 5 p.c. Red. Deb.	46—48	..	..
470,000	Stk.	Mar. 22	6	6	Sheffield A	100—102e*	..	..
419,968	,,	,,	6	6	Do. B	100—102e*	..	..
1,047,000	,,	,,	6	6	Do. C	100—102e*	..	..
90,000	10	May 26	4	6	South African	4—6	..	..
6,609,895	Stk.	Feb. 23	5	7½	South Met. Ord.	104—106	..	104½—106
500,000	,,	,,	—	6	Do. 6 p.c. Irred. Pf.	109—112	..	..
1,895,445	,,	Jan. 12	8	8	Do. 8 p.c. Deb.	59—62	..	..
794,000	,,	Mar. 8	6½	6½	Do. 6½ p.c. Red. Db.	99—101	..	..
91,500	,,	Feb. 23	8½	8½	South Shields Con.	112—114d	+2	..
1,343,795	,,	Feb. 23	6½	6½	South Suburban Ord. 6 p.c.	105—108	..	106
868,837	,,	Dec. 22	5	5	Do. 5 p.c. Deb.	93—96	..	..
647,740	,,	Mar. 22	5	5	South'mpton Ord. 5 p.c. max.	78—80	+1	78½—79½
131,275	,,	Dec. 22	4	4	Do. 4 p.c. Deb.	72—75	..	75
350,000	,,	Mar. 8	7	7	Swansea 7 p.c. Red. Pref.	100—103	..	..
300,000	,,	Dec. 22	6½	6½	Do. 6½ p.c. Red. Deb.	99—102	..	..
120,000	,,	Feb. 23	7½	7½	Tottenham District A 5 p.c.	112—117	..	114
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	92—95	..	94
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	98—101	..	..
181,255	,,	Dec. 8	4	4	Do. 4 p.c. Deb.	74—77	..	..
258,261	,,	Mar. 8	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, &	78—80d	..	..
289,094	,,	Mar. 8	6½	6 5/16	Wycombe 5 p.c.	88—93	+2½	89—92
98,330	,,	,,	5	5	Do. 5 p.c. pref.	83—88	..	..
80,000	,,	Mar. 8	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	129—134	..	
255,686	,,	,,	7	7	Do. B 3½ p.c.	111—116	..	111½
432,585	,,	,,	5/19/0	5/19/0	Do. C and New	98—103	..	..
362,060	,,	,,	6⅝	6⅝	Do. Wimbledon 5 p.c.	106—111	..	..
98,000	,,	,,	7½	7½	Do. Epsom 5 p.c.	112—117	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	86—91	..	..
88,416	,,	Dec. 22	8	8	Do. 8 p.c. Deb.	57—60	..	58½
284,741	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	..	..

Quotations at:—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle e.—Sheffield. f.—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. ‡ For year.